DOCUMENT RESUME

ED 120 011 SE 020 482

AUTHOR Martin, Rogers William
TITLE An Analysis of Selected Characteristics of the Secondary Mathematics Teachers and Mathematics Curricula in Caddo Parish, Louisiana.
PUB DATE Jul 75
NOTE 214p.; Ed.D. Dissertation, Walden University; Marginal legibility in appendices

EDRS PRICE MF-$0.83 HC-$11.37 Plus Postage
DESCRIPTORS *Curriculum; Doctoral Theses; Educational Needs; Mathematics Education; *Mathematics Teachers; *Research; Secondary Education; *Secondary School Mathematics; Surveys; *Teacher Education

ABSTRACT

The purposes of this study were to determine the mathematical training of a representative sample of the secondary mathematics teachers in Caddo Parish, Louisiana, and to determine if the present offerings in the high school mathematics programs in the parish were those recommended by the authorities in the field of secondary mathematics education. Questionnaires were sent to all mathematics teachers in the junior and senior high schools in Caddo Parish. A comparison of the standards established by national mathematics organizations for training of secondary mathematics teachers with the training received by the Caddo Parish secondary mathematics teachers was made. Eight sets of recommendations were identified and used in the study. Comparisons revealed deficiencies in the training of some teachers. (SD)

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AN ANALYSIS OF SELECTED CHARACTERISTICS OF THE SECONDARY MATHEMATICS TEACHERS AND MATHEMATICS CURRICULA IN CADDO PARISH, LOUISIANA

BY

ROGERS WILLIAM MARTIN

B. S., CENTENARY COLLEGE, 1948

M. Ed., NORTHWESTERN STATE COLLEGE, 1964

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF EDUCATION

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A review of related literature revealed that seven national mathematics organizations and one unpublished Ph. D. dissertation had made recommendations since 1961 for the preparation of secondary mathematics teachers in the undergraduate years of college. Recommendations of curriculum authorities, in the field of secondary mathematics, were also found that aided in determining if the mathematics topics taught in Caddo Parish high schools met these recommendations or not.

From the representative sample of mathematics training of the high school teacher in Caddo Parish, it was determined by a comparison with the eight sets of recommendations that the majority of the sample could be definitely declared not to be qualified by the national associations' recommendations. It, also, was determined that a majority

of the teachers in Caddo Parish, Louisiana, was not qualified to teach the mathematics courses they were assigned to teach by the criteria of national standards. The majority of the topics taught in the high school mathematics program, at the time of this study, was found to meet the standards of prominent and acceptable curriculum authorities in the field of secondary mathematics.

It was found that the needs of the college-bound Caddo Parish students were being met. However, it was also found that the needs of other segments of the student population evidently were not being met. Therefore, the mathematics subject offerings in Caddo Parish were not meeting the needs of all the students.

ACKNOWLEDGEMENT

To my wife, Sue Lynn, and son, Rogers, Jr., a deep feeling of gratitude is expressed for their untiring patience and support, without which, this undertaking would have been impossible.

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CHAPTER I

STATEMENT OF THE PROBLEM

DEFINITION OF THE PROBLEM

Introduction

In Caddo Parish, Louisiana, there were ten senior high schools and fifteen junior high schools in the Fall of 1972. Secondary mathematics was taught in both types of schools because, by definition, the ninth grade was the beginning of secondary mathematics, but the ninth grade was housed in the junior high schools, since the junior high schools included grades seven through nine.

In each school there were three or more full-time instructors in mathematics. There was a group of eighty-eight professionally educated teachers in the total group. The professional education and qualifications of this group of mathematics teachers were very important to the success of the nearly 52,000 students being educated in the parish. Eventually, all of these students, with the exception of the dropouts and transfers, will study mathematics, as it is a requirement for graduation.

Minimum qualifications for mathematics teachers in public high schools were established by the Louisiana State Department of Education, which was the state governing agency for state supported schools. Colleges and universities which supply teachers for the

public schools were both in the State of Louisiana and outside the state, and each institution also had its own qualifications.

Need for the Study

In this technological age, with its emphasis on mathematical courses, it is important that the mathematics teachers in secondary schools be current in their mathematical knowledge. The education of secondary students by persons who are not up-to-date in subject matter in the field of mathematics would impose upon the student a handicap that would be almost impossible to overcome, as mathematics has undergone a complete revolution in content and style in the last fifteen years. Many institutions of higher learning have gone to the modern approach in mathematics, and it is vital that students in public schools, who may attend these institutions, be taught by well-informed teachers.

Caddo Parish has gone from a segregated system with two systems to a unified system where teachers of the white and black race teach integrated classes. It is especially important that all teachers, regardless of race, be compared with a norm in mathematics education that is acceptable to the authorities in mathematics in the secondary education field.

Along with the study of the background of the mathematics teachers, it is also important to see that the program of mathematics offered to secondary students in Caddo Parish is adequate. The program of mathematics offered to secondary school students in Caddo Parish should be compared to that program of instruction recommended by the authorities in the field of secondary mathematics education to determine if the needs of the students are being adequately fulfilled.

If the requirements in mathematics education of the mathematics teachers were constantly changing, it was only reasonable to expect the mathematics offered at the secondary level to be constantly in need of revision. Therefore, the programs offered should be checked for relevance, along with the qualifications of the teachers. Consequently, it was very appropriate, at that time, that this study be conducted in Caddo Parish, as it would be of real value in evaluating the professional background of its mathematics teachers and the secondary mathematics curriculum.

Purpose of the Study

The purposes of the study were to compare the mathematical training of Caddo Parish mathematics teachers with national standards and to compare mathematics curriculum with the curriculum recommended by the authorities in the field of secondary education. These objectives were to be accomplished by securing a sample of teachers' training by questionnaire and analyzing the sample. Then, from the sample, projections could be made concerning the total population of mathematics teachers in Caddo Parish. This sample was to exceed 68 per cent of the mathematics teachers in Caddo Parish.

Questionnaires were sent to each principal of the junior and senior high schools in Caddo Parish, Louisiana, requesting information concerning the authors, publishers, and copyright dates of textbooks used in the mathematics classes. From this information, a list of topics taught in each class was formulated. Then, a comparison was made with a mathematics program recommended as meeting the minimum standards by the College Entrance Examination Board and the School Mathematics Study Group.

Value of the Study

These findings were made available to all interested persons which included teachers, administrators of Caddo and other parishes, along with parents who were interested in the type of education their children were receiving in Caddo Parish. This study was of value to the Central Office of the Caddo Parish School Board in that it pinpointed the areas of deficiencies and the areas of strength in the mathematical background of the mathematics teachers. Many of the teachers were appointed a decade or more ago, and their training was adequate at the time of their appointment; however, many teachers are reluctant to take time off for additional education and training to keep their knowledge and skills up-to-date.

The Board of Education, composed of the professional men of the community, is always interested in the evaluation of the instruction in the district under their control. The Board was informed by this study as to the exact state of mathematical instruction in the parish. In the past, all comparisons have been made to a national norm. This study has continued that tradition and compared the mathematics teacher personnel against a national norm as recommended by the leading authorities in the field. The State Department of Education of Louisiana, to which a copy of this study was furnished, could correctly evaluate the mathematics instruction in the parish by consulting the recommendations and results of the study.

Teacher training institutions of the State of Louisiana, particularly Northwestern State University, Natchitoches, Louisiana, which provides more teachers for the secondary schools of Louisiana than any other institution, profitted from the study. From the results

of the study, the math preparation weaknesses of the teachers involved in the study were pointed out, and the courses that must be offered to in-service groups and in summer schools were determined.

Delimitation of the Study

This study was limited to the junior and senior high school teachers in Caddo Parish in the Fall of 1972. As the study was concerned with secondary mathematics, only those mathematics teachers who taught mathematics at the ninth grade level or higher were considered in the study.

Definition of Terms Used

"Teacher preparation" in this study included all academic classes, training, practice or actual teaching, and related activities experienced by participation in and performance of work in a delegated area. "A course" meant a three-semester-hour presentation of a selected subject and was not meant to exclude integrated programs or other curricula arrangements. "Elective" in this study meant a course offered by a college or university which was not a requirement for graduation in all areas but could be taken to increase the student's total semester hours earned toward graduation. "Career student" was the term applied to the student who did not have any intention of attending a college or university upon graduation from high school.

Sources of Data and Method

A normative-survey method of research was employed in this study, utilizing two questionnaire data-gathering mailings. The first questionnaire was constructed for teachers trained in Louisiana colleges and

universities. The other questionnaire was sent to principals of junior and senior high schools in Caddo Parish, Louisiana (see Appendix A for questionnaires and details of construction).

A search was made of related literature, and letters were sent to the current addresses of the more widely known national mathematical organizations concerned with mathematics education at the secondary level for sets of current recommendations for teacher training. Twelve sets of recommendations were obtained and from these, eight sets were selected as a basis for comparing the Caddo teachers.

A national standard of teacher preparation was formulated, using the seven current national mathematical organizations' recommendations and one Ph.D. dissertation's recommendations. The mathematical preparation of the mathematics teachers of Caddo Parish was compared to this standard. The mathematics background of each teacher in Caddo Parish was also compared with the recommendations of each national mathematical organization. These comparisons were made to determine if the teachers were qualified from a national standard. Then, the exact number of recommended courses in mathematics the Caddo Parish mathematics teachers had completed in undergraduate or graduate courses was compared with each set of recommendations. From this comparison, a percentage figure of the total courses completed was obtained. Then, conclusions were drawn as to whether or not the teachers were qualified to teach secondary mathematics.

The questionnaires from the principals of junior and senior high schools were tabulated to show which mathematics topics were taught in each school in the parish. From the questionnaires, charts were constructed for ease of reference.

The topics taught in mathematics classes in the Caddo Parish schools were tabulated for comparison with those recommended by the acknowledged authorities. From this comparison, conclusions as to the sufficiency of the topics taught in Caddo Parish schools were drawn.

Preliminary Problems

Two preliminary problems which were basic to the major purpose of the study could be stated as follows:

1. Were the teachers in Caddo Parish, Louisiana, adequately trained in mathematics, from the national viewpoint, to be declared qualified to teach secondary mathematics?

2. Were the courses offered to students in secondary mathematics in Caddo Parish comparable to those recommended by recognized authorities in the field of secondary mathematics?

In the comparison of the teachers of Caddo Parish with a national standard of competence, a number of pertinent questions arose. Such questions, which could be regarded as subproblems, included the following:

1. How was a national standard to be determined?

2. What national association's recommendations, if any, were to be used as a basic pattern with which to compare the training of the teachers of Caddo Parish, Louisiana?

Summary

In this chapter a clear and complete statement of the problem was given. In the sections on the need and purpose of the study, a validation or justification of the problem was established. In the section on the value of the problem, the importance of the problem was

determined. The sources of data and method section gave a preview of the organization of the remainder of the dissertation.

CHAPTER II

SURVEY OF RELATED LITERATURE

Introduction

The purpose of this chapter was to present a resume of all the recent recommendations for teacher training for secondary mathematics teachers that could be found in related literature and by random mailings of requests to mathematical associations. The libraries of Louisiana State University and a local college were used to review the related literature. The names of the universities and the college utilized are specifically stated in the chapter on procedures. The main points of all the recommendations selected for use were given, along with the details on at least one set of recommendations in each of three groups. The three groups were determined by the method of presentation of the mathematics courses in the recommendations by the national organizations.

Recommendations for Mathematics Teacher Training by Associations

By a review of the related literature and by sending letters to the addresses of the mathematical associations and other organizations interested in mathematical education, twelve sets of recommendations were obtained. Four sets of recommendations by national associations were disregarded as they were outdated, and their requirements were included in more recent recommendations. These

organizations, associations, and individuals are listed below, along with the date of publication of recommendations, and an appropriate abbreviation in parenthesis:

1. Mathematical Association of America, Committee on the Undergraduate Program (CUPM, 1961).

2. The National Association of State Directors of Teacher Education and Certification (NASDTEC, 1961).

3. Unpublished Dissertation of Bill Bompart, University of Texas (Bompart, 1967).

4. The Midwest Regional State College Conference on Science and Mathematics Teacher Education (Midwest Conference, 1968).

5. The College Entrance Examination Board (CEEB, 1969).

6. National Association of State Directors of Teacher Education and Certification, AAAS (NASDTEC, 1971).

7. Mathematical Association's Committee on the Undergraduate Program in Mathematics (CUPM, 1971).

8. National Council of Teachers of Mathematics (NCTM, 1972).

The eight sets of recommendations listed above were in chronological order as to date of publication. In discussing the actual courses suggested, the recommendations were grouped according to the manner of presentation of the desired mathematical knowledge.

Three organizations, CUPM (1961), CUPM (1971), and NASDTEC (1961), published their recommendations in levels or numbered guidelines and were considered Group I. Bompart (1967), Midwest College (1968), and CEEB (1969), stated their recommendations in courses and semester hours and were in Group II. NASDTEC (1971) and NCTM (1972) expressed

their recommendations in desired abilities and skills acquired and were in Group III.

One set of recommendations in each group was given in detail to the extent that it was available in the publication or source. In the other sets of recommendations, only the main points were listed.

CUPM (1961)

Level I, teachers in elementary schools, were to be given a two-course sequence dedicated to the real number system and a course in the basic concepts of algebra. This was to be followed by a course in informal geometry (25:634).

Level II, teachers in grades seven through ten, were recommended to study elementary analysis in three courses (containing analytic geometry). Other courses were thought to be necessary for these teachers, and these courses were: geometry, abstract algebra, and probability from a viewpoint of set-theoretics. An introduction to the language of logic and sets was to be in one of these courses (25:635).

Level III, teachers in grades nine through twelve, were expected to have a major in mathematics and a minor in an allied field. These teachers should have all the courses listed for Level II and an additional course in algebra, geometry, and probability-statistics, and one more elective (25:635).

Level IV recommendations suggested that these teachers hold a Masters degree, with at least two-thirds of the courses being in mathematics (25:635). Level V recommendations dealt with college mathematics teachers (25:637-38). See Table 1, page 12, for brief summary of recommendations.

TABLE 1

SUMMARY OF RECOMMENDATIONS OF CUPM FOR 1961

Level	Description	Degree	High School prerequisites	Minimum number college courses
I	Elementary School	B.A.	Two Years of College Preparatory Mathematics	4
II.	Elements of Algebra and Geometry	B.A. Mathematics Minor	Preparation for Analytic Geometry and Calculus	7
III.	High School	B.A. Mathematics Major	Preparation for Analytic Geometry and Calculus	11
IV	Elements of Calculus, Linear Algebra, Probability, etc.	M.A. in Mathematics	Preparation for Analytic Geometry and Calculus	18 (approx.)

Breakdown by Subjects

Level	Numbers	Analysis	Algebra	Geometry[a]	Probability-Statistics	Elective
I	2		1	1		
II		2	1	2	1[b]	1[c]
III		2	2	3	2[b]	2[c]
IV[d]		4	2	3	2	7

[a] Including analytic geometry.
[b] An introduction to the language of logic and sets should appear in some one course.
[c] Preferably from the areas specified.
[d] The numbers in this row indicate the approximate number of courses.

Source: "Recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics," The Mathematics Teacher, December, 1960, Table, p. 636.

NASDTEC (1961)

Guideline I: Six hours in algebra and geometry were recommended, as was the study of analytic geometry and calculus. Along with modern algebra, it was felt that linear algebra, vectors, and finite matrices should be studied (15:23).

Euclidean geometry should be thoroughly studied by the future secondary teacher. The student could study the formulation of Euclidean geometry in the light of synthetic projective geometry, or Euclidean and analytic projective geometries, et cetera.

Guideline II: Nearly nine semester-hours were suggested in the study of analytic geometry and calculus (15:24). The future teacher should be endowed with a comprehension of the phases of the subject which his students would encounter in future courses.

Guideline III: A major in the subject taught was desired. Included in these subjects should be probability, statistics, set theory, and elementary logics. Auxiliary courses in algebra, geometry, number theory, probability and statistics, and analysis should be chosen (15:24).

Guideline IV: The schedule of courses should contain suitable provisions for later work in mathematics at the graduate level. The courses should emphasize the instruction in mathematics in advanced programs, such as introductory classes in calculus, statistics, probability, and linear algebra (15:25).

Guideline V: The fifth year could be the year that the teachers would fill in the intervals in their mathematical preparation. A fifth-year schedule of subjects should accentuate the subject that was to be taught (15:25).

Guideline VI: The schedule should contain work in fields related to the subject the candidate was to teach. The courses at the undergraduate level should contain courses in physics and subjects in an allied field in which applied mathematics would be used (15:25).

Guideline VII: Numerous other aspects must be considered in the education of the cultured individual who was to be trusted to guide our youth in their quest for an education. Among these aspects were the trends in curriculum change, changes in teaching techniques, et cetera (15:25).

CUPM (1971)

The Committee on the Undergraduate Program in Mathematics formulated its "Recommendations for the Training of Teachers of Mathematics" in 1961 during the early innovations brought about by modern mathematics curriculum reform. These recommendations were presented at five levels of teacher competency. The levels were:

1. Teachers of elementary school mathematics--grades K through 6.
2. Teachers of the elements of algebra and geometry.
3. Teachers of high school mathematics.
4. Teachers of the elements of calculus, linear algebra, probability, etc.
5. Teachers of college mathematics (1:1).

An indication of the acceptance of Level II and III guidelines by the teaching community was the publication of numerous textbooks, whose prefaces claimed adherence to the CUPM guidelines. In the 1961 guidelines, teachers were classified into three groups (see above); in 1971 it was found to be convenient to use four classifications:

Level I: Teachers of elementary school mathematics (grades K through 6).

Level II-E: Specialist teachers of elementary school mathematics, coordinators of elementary school mathematics, and teachers of middle school or junior high school mathematics (roughly grades 5 through 8).

Level II-J: Teachers of junior high school mathematics (grades 7 through 9).

Level III: Teachers of high school mathematics (grades 7 through 12) (1:9).

CUPM recommended that the classifications be taken rather loosely. Local conditions and curricular organizations would be the determining factors in their interpretation.

Level II Recommendations: Since the first set of recommendations was issued in 1961, significant changes have taken place in junior high school mathematics. These alterations are in depth (for example, greater emphasis is put on logic and mathematical exposition) and in breadth (for example, the increased amount of geometry and probability).

CUPM recognized the fact that in the middle or junior high school it was preferable to recognize two kinds of teachers of mathematics: those teachers who concentrate on the transition from the elementary school and those teachers who concentrate on the transition to the high school. Therefore, CUPM gives two sets of recommendations for this level (1:14).

CUPM recommended that all mathematics teachers take Level I, which consisted of:

> A twelve semester-hour sequence that includes development of the following: number systems, algebra, geometry, probability, statistics, functions, mathematical systems, and the role of deductive and inductive reasoning. The recommended sequence is based on at least two years of high school mathematics that includes elementary algebra and geometry (1:10).

Level II-E:

1. The Level I program: A student who is already prepared for calculus may omit the course on functions of the second sequence of courses listed above (1:14).

2. An elementary calculus course: At this level, all teachers need an introduction to analysis and an appreciation of the power that calculus provides.
3. Two courses in algebra: The courses in linear and modern algebra are identical to those described under 3 of the Level III recommendations.
4. A course in probability and statistics: This course is identical to the first course under 4 of the Level III recommendations.
5. Experience with applications of computing: This recommendation is identical to that under 6 of the Level III recommendations.
6. One additional elective course: For example, a further course in calculus, geometry, or computing (1:14).

Level II-J Recommendations:

1. Two courses in elementary calculus: Greater emphasis on calculus is desirable for this level because teachers at the upper level of the junior high school must see where their courses lead.
2. Two courses in algebra: The courses in linear and modern algebra are identical to those under 3 of Level III recommendations.
3. One course in geometry: Either of the two courses described under 5 of the Level III recommendations will suffice.
4. A course in probability and statistics: This course is identical to the first course described under 4 of the Level III recommendations.
5. Experience with applications of computing: This recommendation is identical to that under 6 of the Level III recommendations.
6. Review of the content of Level I: There is a problem with the interface between the elementary school and the junior high school. We therefore believe that some sort of orientation to the mathematical content and spirit of the elementary school mathematics program is necessary to equip the Level II-J teacher properly. Two means have been considered to meet this need.
7. Two elective courses: In order to give the teacher freedom to pursue his interests, electives are suggested, with further courses in computing, analysis, algebra, and geometry having high priority (1:14-15).

Level III Recommendations:

The minimum preparation of high school teachers of mathematics should include:

1. Three courses in calculus: This recommendation assumes that the student has the necessary prerequisites. It is

also desirable to take advantage of the growing role of computers in introducing mathematical concepts.

2. One course in real analysis: Introductory Real Variable, Theory would be satisfactory provided that the instructor is aware of the primary interest of his students in teaching.
3. Two courses in algebra: The courses are identical to those described under 3 of the Level II-J recommendations.
4. Two courses in probability and statistics: This course is identical to the course under 4 of the Level II-J recommendations.
5. Two courses in geometry: One course emphasizes a traditional approach by concentrating on synthetic methods and a careful study of the foundations of Euclidean geometry with a brief treatment of non-Euclidean geometry. The other course is strongly linked to linear algebra.
6. Experience with applications of computing: This should involve learning the use of at least one higher level programming language such as BASK or FORTRAN.
7. One course in applications: This should place heavy emphasis on mathematical models in the physical or social sciences (1:15).

Out of the twelve courses listed, nine should be included in the undergraduate program of every prospective high school teacher; namely 1, 2, 3, 6, and one course from 4 and 5.

In formulating a degree plan in mathematics a student will, in all likelihood, choose electives in line with his career goals. Listed below are some electives which would suitably extend the recommendation for the training of high school mathematics teachers.

Real Variables
Complex Variables
Numerical Analysis
Abstract Algebra
Geometry and Topology
Number Theory
Foundation of Mathematics
Logics and Linguistics (1:115-18).

Bompart (1967)

Bompart, in "The Development of an Undergraduate Program for Prospective Secondary School Mathematics Teachers Based on an Analysis of State Certification Requirements," (unpublished Ph.D. dissertation,

University of Texas, 1967), recommended two programs: a four-year program and a five-year program (20:809). The four-year program in mathematics required the completion of thirty-three semester-hours. Three semester-hours were recommended in the foundation of mathematics (a general review of algebra and trigonometry, logic, sets and the real number systems). Analytic geometry should be taken for three semester-hours. Calculus should be studied for six semester-hours. Geometry should be pursued for six semester-hours. Six semester-hours should be spent on probability and statistics. Three hours should be invested in the study of linear algebra. Algebraic structures should be studied for three semester-hours. A course in teaching mathematics in the secondary school should be taken for three semester-hours.

This program has a total of 124 semester-hours with twenty semester-hours in the minor. Bompart stated that this program satisfied the state requirements of forty-one states. In the five-year program, the requirements were the same as the four-year program with the following additions: advanced calculus to be studied for three semester-hours; differential equations for three semester-hours; computer mathematics for three semester-hours; and history of mathematics for three semester-hours.

The total semester-hours in this program is 154 with a minor in twenty-four semester-hours. This program satisfied the state certification requirements for mathematics teachers of all but three states (20:810).

Midwest College Conference (1968)

The Midwest Regional State College Conference on Science and Mathematics Teacher Education, as reported by Brown in School Science

and Mathematics (January, 1968), stated that Ball State Teachers College required a core of seven courses which began with college algebra and trigonometry and concluded with differential equations. Among the electives were listed: statistics, theory of equations, modern algebra, modern synthetic geometry, projective geometry, and advanced calculus. For the Masters degree in mathematics, the requirements were seven courses in mathematics and five courses on related electives; three of the seven courses must be in one of these three fields: analysis, algebra, and geometry (21:31-32).

Landin reported that the University of Illinois required of future mathematics teachers during the junior and senior years three semester-hours of work in four basic areas: Mathematical Systems (a. axiomatic and b. logic), real numbers, modern algebra, and geometry (axiomatic treatment). To supplement the above work, six semester-hours should be taken from these areas: advanced calculus (including metric topology); applied mathematics (that is, statistics, application to physics, numerical analysis, et cetera); geometry (including topology); and algebra (24:29-30).

CEEB (1969)

The Commission on Mathematics of the College Entrance Examination Board and Teacher Education's recommendations, as reported by Rourke in The Bulletin of the National Association of Secondary School Principals, May, 1969, were briefly stated. A summation of these points was:

For the future teacher of senior high-school mathematics, a college major in the subject was to be contemplated as the minimum necessary if the teacher was to be qualified to cope successfully with the full range of senior high-school courses. Such a study schedule

must include work in analysis, algebra, geometry, and statistics. It is also desired that courses in fundamental concepts and logic be studied and as many electives in the mathematics field be selected as possible. Calculus, in the first course, must be thought of as either a preliminary to the major or as the first course in the major (26:173).

The minimum essentials in the professional education of a prospective teacher in mathematics in the senior high school are:

Four years of high-school mathematics, thirty hours of college mathematics (calculus and analytical geometry; analysis; abstract algebra; geometry; statistics; and logic) (26:174).

NASDTEC (1971)

The Recommendations of the Project on the Education of Secondary School Teachers of Science and Mathematics, sponsored by the AAAS Commission on Science Education and the National Association of State Directors of Teacher Education and Certification, and supported by the National Science Foundation, dated September, 1971, were as follows (16:21):

A vital part of the preparation of all secondary school mathematics teachers is in the field of analysis. Every future teacher of secondary school mathematics should study elementary and intermediate calculus. He should:

1. Be proficient in solving standard problems of the differentiation and integration of elementary functions and the applications of these processes.

2. Understand the extension of the procedure of differentiation and integration to functions of more than one variable; he should

comprehend the calculus of vector functions and be able to utilize it on motion problems.

3. Comprehend the meaning of the implicit function theorem.

4. Be knowledgeable of the basic limiting procedures as they occur in calculus, embracing infinite series, improper integrals, interchange of limits, and uniform convergence.

5. Be competent in solving elementary differential equations and problems comprising first and second order differential equations (16:22).

The future high school teacher should study analysis at a more advanced level, in addition to the elementary and intermediate analysis previously discussed. The student should:

1. Have completed one, of the several, constructions of the real number system from the rationals.

2. Be abreast of the concepts of open set, limit point, closed set, and connected sets in the context of the real line or the plane.

3. Be knowledgeable of what it means for a function to be Riemann integrable, and know the conditions for integrability.

Algebra: The future teacher should be familiar with the elements of linear algebra. The teacher should know n-dimensional Euclidean spaces, and geometry and algebra of vectors in these spaces. He should understand and be able to solve systems of linear equations, and should know how to use matrices in this connection. The prospective teacher will be expected to have a knowledgeability of the concept of a linear transformation, embracing its representation by a matrix, and he should be able to define his work in solving systems of equations in terms of linear transformations (16:23).

The prospective teacher of secondary mathematics is expected to study the principal structures of abstract algebra, including groups, rings, fields, and vector spaces. He should be able to present these frameworks by giving numerous elementary examples, which would give substance to the abstract ideas while illustrating the power of mathematical abstraction. In this context, rings could be illustrated through sets of integers, polynomials, and matrices; fields through the rational, real, and complex number systems. The group concept could be presented through various groups of transformations, permutations, and symmetries. Using such illustrations offers the chance to point out interconnections between algebra and geometry. The future teacher should be knowledgeable in the basic concepts of homomorphism, kernel, and quotient construction, as well as applications and consequences of these ideas (16:23).

Geometry: In general mathematics classes and in junior high school, informal and intuitive approaches to geometry are employed. In deductive courses in geometry the method often used to provide a basis for conjectures is the informal explanation of relations among plane and space figures. Many types of approaches are used in teaching geometry including coordinates, vectors, and transformations. The geometry teacher must be able to adapt his teaching to each of these approaches, while having the ability to be flexible in adaptation to new approaches, as future courses in geometry are continually being developed. In accordance with these ideas the future secondary mathematics instructor should:

1. Have the ability to demonstrate many of the usual geometric concepts informally; for example, by paper folding.

2. Be familiar with the role of axiomatics in synthetic geometry and the entity of various axiom systems for Euclidean geometry.

3. Be capable of proving theorems such as the concurrence of the medians of a triangle by the use of either coordinates or vectors.

4. Comprehend the existence of other geometries by being able to demonstrate several theorems in at least one other geometry from the following: non-Euclidean geometry, projective geometry, or affine geometry.

5. Be capable of discussing the role of transformations, at least in Euclidean geometry.

6. Comprehend thoroughly the interconnections between algebra and geometry (16:24).

Future teachers of geometry have a distinctive need for understanding logic, especially the fundamental principles used in mathematical reasoning. He should be well informed with connectives and the algebra of statements, various forms of statements of equivalences, and implications, and be able to state the denial of a statement containing universal or existential quantifiers (16:24).

Probability and statistics: Curriculums of secondary schools are steadily being penetrated by topics in probability and statistics. Misconceptions occur fairly often in these areas. Therefore, it is vital that the future secondary mathematics teacher be properly educated to teach these subject areas. In the field of probability such education should include a precise knowledge of the concepts of sample space (space of outcomes), event space, probability function, and the basic probability axioms. The formation of the subject field should contain additional probability through Bayes theorem and the basic concepts related with

random variables (distribution function, probability density function, expected value, mean, variance, and standard deviation). The instructor should be knowledgeable in calculus-based probability and statistics even though he would not instruct probability and statistics from this point of view at the secondary level.

The real world could be used to present statistics as applied probability in which probability space is used to model a situation. The emphasis should be on the associated concepts of statistical population, population parameter, and statistical sample. The subject should be developed to include the ideas of statistical estimation, test of a statistical hypothesis, and confidence interval.

An instructor of probability and statistics should pursue the subject beyond understanding basic probabilistic concepts and have experience using statistical analysis. Field and laboratory experience in using probability is a must. In uncomplicated cases, he should be knowledgeable in collecting the relevant data, preparing of statistical summaries, selecting suitable methods of statistical analysis and making the appropriate statistical computations (16:25).

Other mathematical subjects: There is a great deal of latitude in what students present as an undergraduate major in mathematics. The amount of time an undergraduate spends on mathematics varies from as little as a fourth to as much as a half. A future teacher of secondary mathematics is expected to study a broader range of subjects than students with other goals; nevertheless, yet he must accomplish in some fields a depth similar to that of the prospective specialist. The requirements of a liberal education and of full professional preparation, always in conflict, are exceedingly demanding on the future teacher. He

should design, therefore, for more than a bare major and have intentions to study subjects such as number theory, the history of mathematics or foundations, combinatorics, complex analysis, and topology, as well as other disciplines. The future teacher should acquire breadth in mathematics, as well as another branch of mathematics, such as algebra or analysis (16:25).

NCTM (1972)

The Commission on Pre-Service Teacher Education, of the National Council of Teachers of Mathematics, officially stated their Proposed Guidelines for the Preparation of Teachers of Mathematics on December 20, 1972. According to Willoughby, these were given in terms of skills and abilities to be mastered.

The teachers of middle and junior high schools should have all the competencies that NCTM listed for teachers of early childhood and primary grades. The junior high school teachers should be able to perform simple problems in probability and statistics and to graph polynomial functions and relations. They should be knowledgeable in the appropriate mathematical procedures so as to be capable of solving problems relating to the physical, biological, and social sciences, and to relate the calculations to junior high school mathematics. They should be able to use methods of linear algebra and abstract algebra. One quantitative science (physics, chemistry, economics, biometrics, et cetera), should be understood by the teacher.

The teachers should have the ability to relate axioms, definitions, and theorems of abstract algebra to the number systems, algebra, and geometry as taught in the secondary school mathematics curricula.

They should be knowledgeable in at least one computer language such as FORTRAN IV, COBOL, BASIC, et cetera.

The teacher at the senior high school level, naturally, should have all the competencies listed for the middle and junior high school teacher. The high school teacher of mathematics should have studied at length in analysis, abstract algebra, linear algebra, geometrics, topology, probability and statistics, logic and foundations of mathematics, and computer science.

The teacher should comprehend and be able to work proofs in some of these branches of mathematics. They should be on knowledgeable ground when discussing the structure of the branch of mathematics and the axiom system studied. They should relate all this to elementary and secondary mathematics. The teacher should be able to relate the given branch of mathematics to other areas of mathematics and other subjects or disciplines. They should have studied at least one quantitative science so as to be capable of building mathematical models and to solve problems in that science with mathematics substantially above the level of elementary calculus (27:6-8).

Need for Compilation of Recommendations

As a result of a search of related literature, it was determined that since 1940 there have been twelve published recommendations for the training of the secondary mathematics teacher by individuals and national mathematical organizations. The first set of recommendations was published by NCTM in 1940. The people who composed these organizations evidently saw a need for some guidelines for the colleges and universities who furnished the undergraduate training of secondary mathematics teachers. For the most part, these people were professional

teachers of mathematics who had spent their lives in the field of mathematics education. The published recommendations, in most cases, were the results of many conferences and deliberations by highly trained and selected individuals.

Each of the organizations, that had published a set of recommendations, represented a selected stratum of the mathematical teaching community. The NCTM presents the view of the high school teachers of mathematics; the Mathematical Association of America presents the view of the college professors; and the National Association of State Directors of Teacher Education and Certification (NASDTEC) presents the view of the State Directors of Teacher Education Colleges, et cetera.

There was a need to compile all the recent recommendations of all the associations representing all the various strata and to determine the results. The composite recommendations determined in this method would not only represent all the various organizations, but would represent the various levels of mathematics education.

Comparison of Recommendations of National Organizations with CUPM, 1971

The second subproblem was solved when a decision was made to use CUPM (1971) as the set of recommendations to be used as a standard by which to measure the mathematical background of Caddo Parish mathematics teachers. Also, it was decided that the recommendations of the Mathematical Association of America's Committee on the Undergraduate Program (CUPM), 1971, would be the standard for comparison with other programs for two important reasons:

1. The pre-eminence of the Mathematical Association of

America in the field of mathematics education at all levels of endeavor.

2. The CUPM (1971) recommendations were in very specific terms and not in generalities.

In the following comparisons of the national mathematical organizations' recommendations, the actual subject by subject comparison from two different views was not given; but only the final difference between the two sets of recommendations:

CUPM (1971) versus CUPM (1961).--The majority of the subject matter was similar. CUPM (1961) did not recommend real analysis and considered a computer course as a minor recommendation.

CUPM (1971) versus NASDTEC (1961).--There was a greater difference of opinion between CUPM (1971) and NASDTEC (1961) than there was between CUPM (1971) and CUPM (1961). Conclusion of comparison between NASDTEC (1961) and CUPM (1971) was that NASDTEC (1961) did not recommend real analysis, abstract algebra, probability and statistics, or a course in computer science.

CUPM (1971) versus Bompart (1967).--Bompart's recommendations were somewhat closer than the requirements of NASDTEC (1961). Bompart required only six hours of calculus, no real analysis, and no computer course.

CUPM (1971) versus Midwest Regional State College Conference (1968).--These two organizations' requirements were very similar. Ball State, whose mathematics curricula was used as an example at the confer-

ence, did not specifically name real analysis. Probability and statistics was an elective, and the computer course was not mentioned.

CUPM (1971) versus CEEB (1969).--These two organizations, also, were very similar. CEEB did not recommend a course in real analysis or a computer course.

CUPM (1971) versus NASDTEC (1971).--NASDTEC (1971) required only six hours in calculus, real analysis was not mentioned by name, and computer science also was not mentioned.

CUPM (1971) versus NCTM (1972).--All the recommendations of CUPM were included in the recommendations of the NCTM (1972) except real analysis. NCTM (1972) gave recommendations in broad general terms and not in semester-hours, et cetera.

These findings were arranged in Table 2, page 30. Table 2 was arranged chronologically according to the date the recommendations were published in a national publication. It was recognized that a certain amount of approximation entered into equating one course by one certifying committee with the course of a similar name by an equally qualified committee. This matter was further complicated by the fact that many courses listed in the recommendations could have similar names or titles, but would cover a different series of topics on the mathematical subject under consideration.

Summary

As was stated in the introductory paragraph, all the recommendations for the training of secondary mathematics teachers were secured from related literature and by direct questionnaires mailed

TABLE 2

CHART OF COMPARISON OF TEACHER TRAINING RECOMMENDATIONS OF VARIOUS ASSOCIATIONS WITH CUPM (1971)

CUPM (1971) Recommendations	CUPM 1961	NASDTEC 1961	Bompart 1967	Midwest 1968	CEEB 1969	NASDTEC 1971	NCTM 1972
1. Calculus (a) 1st course	x	x	x	x	x	x	x
(b) 2nd course	x	x	x	x	x	x	x
(c) 3rd course	x	x		x	x	x	x
2. Real Analysis							
3. Algebra (a) 1st course (linear)	x	x	x	x	x	x	x
(b) 2nd course (abstract)	x		x	x	x	x	x
4. Probability and Statistics	x	x		x	x	x	x
5. Geometry one course (Euclidean)	x	x	x	x	x	x	x
6. Computer Course							x

Full descriptions of abbreviations:

1. CUPM - Mathematical Association of America, Committee on the Undergraduate Program, 1961.
2. NASDTEC - The National Association of State Directors of Teacher Education and Certification.
3. Bompart - Unpublished dissertation, University of Texas.
4. Midwest Conference - The Midwest Regional State College Conference on Science and Mathematics Teacher Education.
5. AAAS - Sub-Committee on Teacher Certification Cooperative Committee on the Teaching of Science and Mathematics, AAAS.
6. NASDTEC - National Association of State Directors of Teacher Education and Certification, AAAS.
7. NCTM - National Council of Teachers of Mathematics.

Source: Based on survey of teacher training recommendations in related literature and random sampling by mail of professional organizations in Fall of 1972.

to random selected national mathematical organizations. Eleven sets of recommendations were obtained that had been published by national organizations and one set of recommendations that had been the subject of a Ph.D. dissertation. Four sets of recommendations were discarded as not being pertinent to this study, as they were outdated. In addition, their requirements had been incorporated in later recommendations.

The national organization that published the recommendations for the training of secondary mathematics teachers and the date of publication was as follows:

Group I consisted of CUPM (1961), NASDTEC (1961), and CUPM (1971). Group II was composed of Bompart (1967), Midwest College (1968), and CEEB (1969). Group III had only two sets of recommendations which were NASDTEC (1971) and NCTM (1972).

A comparison was made of each set of recommendations with the CUPM (1971) recommendations, as CUPM (1971) was selected as the set of recommendations to which the training of Caddo Parish teachers would be compared. This comparison was brief and concise.

Secondary Mathematics from Various Viewpoints

Introduction

In this section, the views of outstanding authorities in secondary mathematics education were presented. The opinions of Douglas, in The High-School Curriculum, were given to show justification for two distinct mathematics programs in high school. Conant, in The Comprehensive High School, was quoted for his formulas for classification of

high schools. Clark, Burks, and Klein, in The American Secondary School Curriculum, expressed some criticism of the current high school and ended up with a statement that geometry, usually thought to be the domain of the superior students, is teachable to the average student.

In Crisis in the Classroom, by Silberman, the curriculum reform movement was discussed and the effect of Sputnik upon this movement. SMSG and CEEB recommendations for each grade level were given, as reported by Kinsella in Secondary School Mathematics. The surveys of The George Peabody College for Teachers made in Caddo Parish were discussed, and the section dealing with recommendations for mathematics instruction was given.

Authorities in the Field of Secondary Education

The program of mathematics in the senior high school has two purposes. The mathematics program can be analyzed functionally in terms of the two purposes outlined by the Post-War Commission (9:465).

The High-School Curriculum, by Douglas, stated:

> 1. To provide sound mathematical training for future leaders in science, mathematics, and other learned fields.
> 2. To insure mathematical competence for the ordinary affairs of life, to the extent that this can be done for all citizens as a part of general education (9:465).

The program for college-bound students is intended to serve the first of the aforementioned two functions. Attempts to provide for the second function are represented in an assortment of courses in mathematics for general education. It is advantageous to scrutinize these two programs separately.

The program offered to students who desire to attend colleges or universities is supposed to fulfill the first of these two functions.

The second function is predicated to fulfill the mathematics requirements of students enrolled in general education.

The program for college-bound students: The courses offered for college preparation remained essentially the same in structure and sequence as defined by the Committee of Ten and Committee on College Entrance Requirements at the turn of the century. With a few exceptions in individual school districts, the traditional program is:

9th grade--Algebra
10th grade--Plane geometry
11th grade--Advanced algebra
12th grade--Solid geometry and trigonometry (9:466).

This schedule was presumed to prepare secondary school students for advanced technical study. The results of the program were not supposed to prepare the student for citizenship duties or home membership. While the schedule has varied little in half a century, some variation in content has come about.

In algebra, more emphasis has been placed on functional topics such as formulas, equations, graphs, and verbal problems, while there has been a de-emphasis on factoring and techniques of algebra. In the field of geometry, while arrival at logical conclusions are still thought to be one of the redeeming features of the course, there has been less emphasis placed on scientific rigor and strict logic. There was an inclination to accept obvious truths and to corroborate others by experimentation. In certain schools, geometry was being utilized as an opportunity for a study of the nature of proof, moving the techniques of critical thinking into nonmathematical areas, such as the generalization of propaganda. In other schools there was an emphasis on the study of form, size, and position, stressing logical thinking

as one of the many important results of studying geometry. The general trend seemed to be toward the latter of the two practices.

There was a growing emphasis to include numerical trigonometry either with algebra or geometry, along with some portions of solid geometry, either intuitively or with proofs. Portions of plane geometry are included, also. These rearrangements are necessary because of the utility of these topics, and as had been demonstrated, only a few students studied mathematics beyond algebra and geometry (9:466).

The Joint Commission of the Mathematics Association of America and the National Council of Teachers of Mathematics, in a report, suggested one plan in which general mathematics was to be presented in the ninth grade. Since an objective of this course was to strengthen the arithmetic of the lower grades, it was recommended that more attention be given to social problems containing more steps than those problems met in previous grades. Another objective was to provide training in arithmetic, graphic representation, algebra, geometry, and numerical trigonometry needed by pupils in the high school subjects of physics, chemistry, economics, and shop work. This ninth grade course presented a generally broad mathematical training good for all students, unless the school offered two separate mathematics programs for the ninth grade (9:466).

As a direct consequence, two new types of courses in mathematics have occurred--a ninth grade general mathematics course and an advanced general mathematics course for the tenth, eleventh, and twelfth grades. The ninth grade course devoted an appreciable amount of time to remedial arithmetic, with application to life problems, employing principles of arithmetic, algebra, geometry, and simple trigonometry.

In application, the course depicted an extension of the junior high school point of view into the ninth grade. The second course in general mathematics was pointed toward closing the space between the mathematical competence of the average citizen and that which was required to successfully cope with the environment. The general schedule of these courses closely paralleled the schedule of the ninth grade general mathematics, with emphasis on more mature applications to adult life.

The program of mathematics for general education created serious problems. One was the necessity of determining in the ninth grade whether to take general mathematics or the college preparatory sequence. The courses intended for college-bound students must be protected against an influx of students who, because of lack of interest or lack of ability, could cause the class standards to be lowered to the degree where success in the work would no longer be a sign of college ability.

General mathematics, on the other hand, must not be besmirched as being less challenging or less respectable. There was also the problem of guidance. Pupil or parental preference, instead of the need for college preparation, would be the criteria for selection of algebra or general mathematics (9:473).

The Comprehensive High School, by Conant, had some very important chapters concerning the mathematics program in comprehensive high schools. Conant was an organic chemistry professor for four years at Harvard University. He then served as president of that institution from 1933 to 1953.

During the War years of 1941-46, he served as chairman of the National Defense Research Committee, and later was appointed United States High commissioner for Germany. He was awarded the Presidential Medal

of Freedom in 1963. He was author of Education In a Divided World, Science and Common Sense, Slums and Suburbs, and The Education of American Teachers' (7:716).

Conant stated that a person cognizant of faculties of a public high school of the comprehensive type would be of the opinion that there was a correlation between the quality of the education offered and the relative size of the staff. He stated, as a matter of record, that he and his staff had discovered such a correlation (5:17).

In Conant's mind, a widely comprehensive high school, as a minimum, should fulfill the following five requirements: (1) offer calculus as an elective, (2) offer a student four years of instruction in a foreign language, (3) offer a program that will enable a student in any one year to select English, mathematics, science, a foreign language, social studies, physical education, art or music, (4) offer one or more advanced placement subjects, (5) employ sufficient English teachers in order that "the average pupil load" is 120 or less (5:16).

The following tabulation brought out the correlation on the staff-student ratio and the percentage of the medium-size widely comprehensive school meeting each of the five criteria:

	Per cent of Schools Meeting				
Staff-student ratio	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Criteria 5
1:17.4 or less	59	88	85	43	58
1:17.5 - 20.4	38	69	72	30	27
1:20.5 - 23.4	34	40	62	31	13
1:23.5 - 26.4	41	45	65	18	10
1:26.5 up	30	48	63	16	10

Conant stated that:

> The reader will note that the first horizontal line of percentage refers to all the schools with a certified professional staff-student ratio of 1 to 17.4 or less; the second refers to

those with a ratio of 17.5 to 20.4, and so on. Under each of the column headings is the percentage of all the schools with a given ratio that meet the criteria in question. Thus, 59 per cent of all the schools with a ratio of 17.4 or less were offering calculus; 88 per cent were offering four years of a modern foreign language. With all five criteria, a higher percentage of the schools with the lower ratio (17.4 or less), was found meeting the criterion than of the schools with a higher ratio (5:17).

Another way of summarizing the correlation would be to say that the chance of finding a school that offers calculus, for example, are 59 out of 100 if the staff-student ratio is 1 to 17.4 or less; the chances are only 30 in 100 if the ratio is 26.5 or higher. If one is seeking any one single criterion to use as the basis for a first approximation to a judgment as to the adequacy of the offerings of a medium-size widely comprehensive school, the certified professional staff-student ratio is to be recommended. If it is 17.4 or less, the chances are good that the school in question will be adequate in a number of respects. Unless a principal can boast of a ratio as low as 17.5, he is not likely to be in a position to offer calculus and four years of a modern foreign language or provide adequately for instruction in English composition (5:17).

Conant stated in The Comprehensive High School, a second report to interested citizens, published in 1967, that Professor Zacharias of the Massachusetts Institute of Technology, was responsible for new courses in physics, chemistry, and biology. Several different programs of mathematics were out of the experimental stage when Conant paid his visits to selected comprehensive high schools in the late fifties (5:54).

Conant constructed a table of the replies to the questions specifically asked to determine if calculus was among the electives of a comprehensive high school and if some form of advanced mathematics was available for those desiring it. On an over-all national scale, 40 per cent of the comprehensive high schools offered calculus, and almost 23 per cent offered an advanced mathematics.

The freshmen in college were increasingly more skilled in specific mathematical skill and, for the course in science, this meant

that these students could have proceeded with the study of science on a more theoretical plane than before. For the future scholar of the social sciences, a course in twelfth grade statistics would have been of more value than calculus. Statistics and calculus should have been offered as electives in the comprehensive high schools. This, also, was the case in some of the high schools Conant visited (5:54).

The American Secondary School Curriculum by Clark, Burks, and Klein, stated that in the waning fifties, senior high school mathematics was taken to task, rather harshly. This faultfinding was brought on by the same erroneous thinking that had caused the unjustified attack on the sciences. The attack resulted from the error of not having taken into account the numerical bases used to calculate the percentages in tables setting forth the enrollment data. In the 1954 study, the gullible critics made the assumption that 86 per cent of the high school graduates had never studied geometry. The data showed only 13.5 per cent of the students were enrolled in geometry. The conclusion was apparently false, because the given percentage represented only one year of the student's four-year course. Working with this same base, and with the assumption that plane geometry was a tenth grade subject, a 25 per cent base for one year would have given the impression that 100 per cent of the students had studied geometry before graduation. The fact that should have been held uppermost in the reader's mind was to correctly ascertain the base used in all tables of percentages used to present numerical data (4:267).

Nevertheless, a great deal of the criticism was justified. In various American school systems, it was possible for a student to study twelve to fourteen years of mathematics without being confronted with

any material formulated after the start of the nineteenth century. With the exception of the last decade, less curriculum revision had taken place in mathematics than any other subject presented to the student in the secondary school. Despite the multiple developments in theory in mathematical thought, various statistical studies presented the fact that the subject organization of the curriculum in mathematics had not been altered in 160 years in many secondary schools (4:267).

An outstanding example was plane geometry. For decades, teachers in secondary schools and colleges and administrators gave as the justification for the study of geometry the fact that it was the best method to teach the students to think and to give clear and logical expressions. Therefore, the importance was stressed, continuously, on the study of the identical theorems and formal proofs. Most mathematicians, on the present scene, agreed that the stated mission would have been immeasurably achieved by means of courses with new content (finite geometry) and other fresh approaches (including the discovery method) (4:267).

Interest in the field of mathematics has recently arisen. Various plans, similar to the Illinois Plan for secondary mathematics, have incorporated modern mathematics. Other new methods of reorganization of the content of mathematics courses of algebra, geometry, solid geometry, and trigonometry have attempted to cut up the material and present them reassembled with new course subtities. Nevertheless, it was safe to assume that it was not mathematics that went out-of-date, but only the courses of study (4:268).

The current student who studied for college went through the

same sequence of mathematics courses as prescribed by the Committee of Ten and the Committee on College Entrance Requirements at the turn of the century, which was: algebra, geometry (plane), advanced algebra, and solid geometry and trigonometry. Outside of a few changes in the ninth and tenth grades, the majority of large city secondary schools presented a consistent pattern of sequential mathematics programs. At the eleventh and twelfth grades, nevertheless, wide diversification took place. Very often, the pattern was: grades nine and ten offered elementary and intermediate algebra; grade eleven offered plane geometry; and grade twelve offered advanced mathematics. An increasing tendency was to incorporate trigonometry in the course with algebra or geometry and to incorporate solid geometry in the course of plane geometry. This latter method did away with some of the disagreeable elements of former courses, and allowed the student to study mathematics above the third year and to become involved with mathematical concepts that were advanced (4:270).

Various critical statements could have been made concerning traditional organization of the curriculum in mathematics at the secondary level. It went without saying, that no person was cognizant of what material was presented by the teacher in any course unless that person was actually present, but generally, Clark, Burks, and Klein stated that the following critical appraisal had substance:

> 1. The point of view of many mathematics teachers is unsatisfactory. Algebra, for instance, consists largely of manipulation when it should be concerned with mathematical structure, and despite the importance of the study of algebraic sets, inequalities, and deductive reasoning, these receive little or no attention in many algebra courses.
> 2. Some geometry courses consist almost solely of rote memory work. It is no wonder students drop mathematics after two years if such geometry comprises the second-year course.

> Moreover, the deductive process is not explained very clearly in spite of the fact that geometry teachers insist that the reason for including geometry in the curriculum is to develop the powers of rational thinking and deductive reasoning.
>
> 3. Mathematics courses of study contain much deadwood. Two examples will suffice: extensive solution of triangles by logarithms and the use of Horner's Methods for finding the roots of a polynomial. The time spent upon such topics could well be reduced and spent more profitably on modern topics.
>
> 4. Some mathematics teachers, luckily only a few, seem to think that high school mathematics should be the exclusive prerogative of the bright children. That anyone should be so biased is unfortunate, for one of the unusual advantages of Euclidean geometry is that it may include exercises that are teachable to "average" students. It is here that the role of mathematics in general education might well be explored (4:270).

Crisis In the Classroom, by Silberman, stated that one of the fables concerning American education, which was deeply implanted and was almost impossible to have extinguished, was the one that accounted for the reform movement in curriculum as a direct result of Sputnik. The appearance of Sputnik in the skies over the United States, indeed, was a traumatic shock to the American pride, which brought about much self-abuse over the state of American education. Admiral Rickover, a chief critic, predicted a scholastic and moral decline as a consequence of the permissiveness of our schools (18:169). Cremin stated:

> When the Russians beat us into space, the public blamed the schools, not realizing that the only thing that had been proved, as the quip went at the time, was that their German scientists had gotten ahead of our German scientists (8:9-10).

Jennings remarked, "It didn't all start with Sputnik" (23:97). In 1952, the University of Illinois Committee on School Mathematics started a program for the revision of secondary school mathematics curriculum. In 1956, the Physical Sciences Study Committee formulated a new high school physics course. The result of Sputnik, in general, was to have hastened these unfoldments, producing public sentiment for

larger federal grants for programs in existence and in the theoretical discussion stage.

Silberman reported that the Physical Sciences Study Committee proclaimed in its first annual report in 1958:

> The Russian satellites, and the furor that followed them, came into being while this process [the Committee's development of the new physics course] was in full course. The principal effect of these events has been to bring the work of the Committee to the attention of the public a good deal more sharply than the Committee would normally have anticipated, and to make it easier to attract support from bodies responsive to public opinion. But neither the goals the Committee had established for itself, nor the process by which these goals are being attained, was affected measurably by Sputnik. The Committee's course has been set not by Sputnik but by the realities of today's culture and today's environment, of which Sputnik and Explorer are equally a product (18:169).

The movement for curriculum reform began outside the educational circles; it all started as a criticism of the intellectual flabbiness of the American educational system. Dewey had prophesied that progressive education would eventually go soft, and he feared this end result (22:204-6). The softness was aggravated by the un-Deweyan and anti-democratic statement that no more than 20 per cent of the student population could have succeeded in an intellectually oriented education. In 1946, the Office of Education stated that most students needed "functional experiences in the areas of practical arts, home and family life, health and physical fitness, and civic competence" (18:170).

From the start, nevertheless, university scholars were providing the leadership in determining the schools' success or failure in reflecting and incorporating advances in knowledge. It was also the scholars' intent to determine the schools' failure to incorporate the

so-called knowledge explosion and the emerging role of knowledge in the economy and in society at large (18:170).

One had only to visit the classrooms to hear the presentations and to examine the books and reading lists to realize that, with mathematics as a possible exception, the so-called educational revolution had made an infinitesimal change in classroom procedure. One of the chief architects of the new curriculum was Bruner of Harvard, who gave the following in answer to the question as to what should have been in the curriculum:

> Whether, when fully developed, the subject or material is worth an adult's knowing, and whether having known it as a child makes a person a better adult. If the answer to both questions is negative or ambiguous, then the material is cluttering the curriculum (3:52).

The response was negative to both inquiries for an unbelievably high percentage of elementary and secondary school curriculum. There was much conversation, needless to say, about informing students of the structure of each scholastic discipline, instructing students how to retain the knowledge, about teaching foundation concepts, concerning "postholing," that is, teaching in greater depth with fewer details. If a person took the time to see the books studied, the assignments given, the classroom conversations, and the tests given, he would come to the conclusion that the majority of the students' time was still occupied with worthless material. Much of this material is actually erroneous, and some of it is irrelevant to any concept, structure or cognitive strategy except the lesson plan. It was exceptional to encounter any teacher, principal, supervisor, or superintendent who had made inquiry into why the subject being taught was being taught (17:172-3).

SMSG recommendations.--The University of Illinois Committee's School Mathematics Study Group (SMSG), as reported by Kinsella, recommended the following subjects in the first course in algebra, ninth grade, which were the results of tryouts and revisions beginning in 1959-60:

1. Sets and the number line;
2. Numerals and variables;
3. Sentences and properties of operations;
4. Open sentences and English sentences;
5. The real numbers;
6. Properties of addition;
7. Properties of multiplication;
8. Properties of order;
9. Subtraction and division for real numbers;
10. Factors and exponents;
11. Radicals;
12. Polynomials and rational expressions;
13. Truth sets of open sentences;
14. Graphs of open sentences in two variables;
15. Systems of equations and inequalities;
16. Quadratic polynomials;
17. Functions (11:46).

The Commission on Mathematics, College Entrance Examination Board (CEEB), Program for College Preparatory Mathematics recommended eleven major topics for an algebra first course, but did not publish a textbook for the course. Kinsella stated that these recommendations were:

1. Operations with simple algebraic expressions;
2. Positive and negative numbers;
3. Linear equations and inequalities in one variable;
4. Variation (optional);
5. Linear equations and inequalities in two variables;
6. Polynomial expressions;
7. Rational (fractional) expressions;
8. Informal deduction in algebra;
9. Quadratic equations;
10. Descriptive statistics (optional);
11. Numerical trigonometry of the right triangle (optional) (11:46).

Kinsella stated that SMSG's recommendations for Grade 10 (the major topics in geometry), were as follows:

1. Review of junior high school geometry;
2. Common sense and exact reasoning;
3. Points, lines, and planes in space;
4. Measure of distance;
5. Half planes, angles, and triangles;
6. Congruence;
7. Geometric inequalities;
8. Perpendicular lines and planes in space;
9. Parallel lines in a plane;
10. Parallel plane in space;
11. Areas of polygonal regions;
12. Similarity;
13. Circles and spheres;
14. Loci and constructions;
15. Area of a circle
16. Volumes of solids;
17. Plane coordinate geometry (11:51).

CEEB's recommendations for Grade 10, according to Kinsella, were presented in 1953. For the college-capable students, the commission gave two proposals;

> (1) understanding of the nature and role of deductive reasoning--in algebra, as well as in geometry; and (2) incorporation with plane geometry of some coordinate geometry, and essentials of solid geometry and space perception (11:49).

The important subdivisions in the commission's course were:

1. Informal geometry;
2. Deductive reasoning;
3. Sequence of theorems leading to the Pythagorean theorem;
4. Coordinate geometry;
5. Additional theorems and originals;
6. Solid geometry (11:49).

The chain of theorems was presented so that the Pythagorean theorem might be reached as quickly as possible. Then, the distance formula would be convenient for use in coordinate geometry (11:50).

In providing the means for the deductive chain, Kinsella reported some of the major assumptions were:

1. Two triangles are congruent if the following corresponding

parts are equal: (a) two angles and the included side; (b) two sides and the included angle; or (c) three sides.
2. The parallel postulate.
3. A line is parallel to the base of a triangle if, and only if, it divides the other two sides into proportional segments (11:50).

The University of Illinois Committee on School Mathematics (UICSM) presented in 1960 Unit 6, Geometry. Kinsella said the major topics were:

1. Measures of segments;
2. Angles and their measures;
3. Triangles;
4. Geometric inequations;
5. Parallel lines;
6. Quadrilaterals;
7. Similar polygons;
8. Trigonometric ratios;
9. Rectangular coordinate systems;
10. Circles;
11. Measures of regions (11:54).

Students have studied in Grade 11, traditionally, intermediate algebra and plane trigonometry. An outstanding criticism of the algebra was that it reviewed and duplicated, to great extent, the content of the ninth-grade course in algebra. Repetition was found to be necessary because of the lapse of a year between the first course in algebra and the second course in algebra, in which the student studied plane geometry. A second criticism was that trigonometry and algebra were not integrated.

Kinsella stated that SMSG's recommendations for Grade 11 were:

1. Number systems;
2. Introduction to coordinate geometry in the plane;
3. Function concept and the linear function;
4. Quadratic functions and equations;
5. Complex numbers;
6. Equations of the first and second degree in two variables;
7. Systems of equations in two variables;
8. Systems of equations in three variables;
9. Logarithms;
10. Introduction to trigonometry;
11. Systems of vectors;
12. Polar form of complex numbers;

13. Sequences and series;
14. Permutations, combinations, and the binomial theorem;
15. Algebraic structures (11:59).

The CEEB's Commission on Mathematics, as reported by Kinsella, presented the following proposals for eleventh-grade mathematics:

1. Basic concepts and skills;
2. Linear functions;
3. Radicals;
4. Quadratic functions;
5. Quadratic equations;
6. Systems of equations;
7. Exponents and logarithms;
8. Series;
9. Number fields;
10. Plane vectors;
11. Coordinate trigonometry and vectors;
12. Trigonometric formulas (11:57).

Kinsella said that SMSG recommendations for Grade 12 were Elementary Functions (first semester), and the second semester schedule was Introduction to Matrix Algebra. The main topics were:

1. Matrix operations;
2. The algebra of 2 x 2 matrices;
3. Matrices and systems of linear equations;
4. Representation of column matrices as geometric vectors;
5. Transformations of the plane (11:65).

At the twelfth-grade level, CEEB presented these alternate programs, according to Kinsella:

1. Elementary Functions (first semester);
   Introductory Probability with Statistical Applications (second semester);
2. Elementary Functions (first semester);
   Introduction to Modern Algebra (second semester);
3. Elementary Functions and Selected Topics (equivalent to Elementary Functions, enlarged to a full year by additional topics) (11:62).

The course on elementary functions, considered of primary importance by the Commission on Mathematics, as presented by Kinsella, contained the following topics:

1. Sets and combinations;

2. Functions and relations;
3. Polynomial functions;
4. Exponential functions;
5. Logarithmic functions;
6. Circular functions (11:62).

In terms of main divisions, the traditional eleventh-grade program did not deviate radically from the new program. The differences were found to be chiefly in the approach and presentation. Items, such as number fields, plane vectors, the new language, sets, certain symbols, terminology from logic and new definitions of variable, function, and relation would not be found in the traditional program. Solid geometry has almost vanished from twelfth-grade programs, and college algebra is difficult to find (11:67).

Local secondary mathematics curriculum.--The George Peabody College for Teachers was authorized by the Caddo Parish School Board to conduct through its division of Survey and Field Services an all-inclusive appraisal of the school system. The study was to have been exhaustive in scope and depth, with scholarly specialists appointed to curriculum areas, and accountants and management specialists from highly respected firms in charge of the evaluation of financial auditing and management effectiveness (10:v). The evaluation of the school system was initiated and terminated in the 1967-68 school year. The results of the evaluation were presented in two volumes for wide distribution within the parish.

The same institution, George Peabody College for Teachers, made a school survey which formulated a plan of action in 1950 to solve critical problems in such an accomplished manner that Caddo Parish was widely acclaimed for its forthright efforts to have upgraded the quality of its schools. There were four members on the 1968 survey staff who

were members of the 1950 staff. It was a solemn experience to have comprehended those areas that mirrored eighteen years of resolute progress; there were propositions that were discarded or ignored; and some areas that were less sufficient in 1968 than in 1950 (10:v).

Caddo Parish, it was stated in the 1968 report, had the ability to accomplish all of the proposals; however, it was recognized that improvement in the system would have only come about from persistent decisions to have accomplished changes for the better (10:v).

The recommendations of the 1968 report for mathematics instruction in the Parish were as follows:

> Mathematics courses in Grades 7-8 are designed to provide a transition from the common learnings elementary program to the more formal mathematics program of the secondary schools. This formal program begins with algebra in Grade 9.
>
> Grade 9 is also the level at which the first real effort is made to provide different kinds of mathematics courses for pupils with differing needs and abilities. These differing courses are general mathematics and Algebra I. The individual pupil decides which of these courses he will take (10:128).
>
> The mathematics program in Grades 7-8 is considered common learning to be taken by all. It is unrealistic, however, to think all pupils will require the same time, two years, to master this material.
>
> Some of the pupils can cover this two-year sequence in one year, others will require the two years, and still others will require three years. Thus, by varying the pace, pupils can have three options within what is essentially the present curriculum. Such a plan as this would be more effective than the present device of "rapid learners" and "slow learners" special sections.
>
> The mathematics program for Grades 10-12 is a dual track system with a minimum opportunity for switchover. The college preparatory sequence includes geometry, Algebra II and advanced mathematics comprising elements of trigonometry and elementary function theory. The sequence for slow learners includes business arithmetic and senior arithmetic (10:128).
>
> The second sequence listed in the preceding paragraph has been devised to meet the needs of certain pupils. However, more and more of the same (and that is what this group has been getting in mathematics ever since Grade 7) is not the best answer.
>
> It is generally conceded that it is even more important to the slow learner to be taught for meaning and insight with emphasis on mathematical structure. Mathematics teachers in Caddo Parish face a real challenge to devise such a program for this sizable number of pupils.

One other group of high school pupils is in need of a specialized mathematics program. This group comprises capable pupils who are probably not college bound. Their need is for a course or courses in solid technical mathematics.

One of the greatest needs of mathematics education in the Caddo Parish schools is a systemwide program of continuous evaluation. Pupil evaluation should be conducted at least at the end of Grade 6 and of Grade 9 for more efficient guidance. In addition, the total mathematics program should be evaluated continuously (10:128).

Summary

As was explained at the beginning of Chapter II, the views of Douglas; Conant; Clark, Burks, and Klein; and Silberman were given as they pertained to mathematics instruction in the secondary-school. The recommendations of SMSG and CEEB were given as to the topics that should be studied at each grade level. The description of two surveys of Caddo Parish by The George Peabody College was given, along with the specific recommendations in mathematics instruction for the parish. The views of the authorities, both national and local, were given to justify the secondary mathematics program in Caddo Parish, Louisiana.

CHAPTER III

PROCEDURES

Introduction

In the chapter on Procedures, all the activities in initiating and completing a study of the Caddo Parish secondary mathematics teachers were described. From the research of related literature to the manner of distribution of the questionnaires, the details were fully given.

The sources of all information were given, along with organizations and individuals contacted, but who did not provide any original data. The reason for showing the latter group was to show that no source was intentionally overlooked in gathering data for the study.

The Compilation of Data

A compilation of data was attempted through a thorough search of the related literature. This search of the related literature was conducted at Centenary College, Shreveport, Louisiana, and Louisiana State University in Baton Rouge, Louisiana. The library of the Northwestern State University at Natchitoches, Louisiana, was also visited.

In an attempt to obtain the very latest recommendations of organizations interested in mathematics education, letters were sent to selected organizations (copies of each letter sent to the national

mathematical organizations are shown in Appendices B, C, D, E, and F, and their replies, if any, are attached).

The Gathering of Data by Questionnaire

The majority of the mathematics teachers in Caddo Parish attended Louisiana higher educational institutions. Therefore, the questionnaire sent to each teacher was constructed from catalogues of the State University of Louisiana, Baton Rouge; Louisiana Tech University, Ruston, Louisiana; and Northwestern State University at Natchitoches, Louisiana. (See Appendix A for a copy of questionnaire). The course titles and numbers were taken from the mathematics section of these catalogues.

The questionnaires were printed on pink paper by the M. L. Bath Company, Shreveport, Louisiana. The identity of each respondent and the location of his school was protected by requesting that no name or school be entered on each questionnaire. However, to insure strict accounting of each questionnaire sent out and returned, a number was printed on the back of each questionnaire, preceded by the words "stock number." These stock numbers ran chronologically from zero to 300. On a control sheet, the respondent's name was entered opposite the appropriately numbered questionnaire. Eighty-eight questionnaires were mailed.

On or about September 15, 1972, the researcher asked for and was granted an interview with Mr. Gregory, Assistant Superintendent of Caddo Parish Schools, at which time the plans for the study were outlined in detail. It was stated that mathematics teachers were to be sent a questionnaire, to be followed in two weeks with a second letter, in the event the original questionnaire was not returned.

Mr. Gregory offered to let the questionnaires be sent out by the interschool mail pickup service called "the gray box" and also offered to supply a computer print-out of the mathematics teachers and their schools. Each Tuesday, a large gray box in each school office was picked up and returned to the Central Office where all mail was collected. Then the mail was deposited in a gray box of each individual school and delivered.

On January 9, 1973, a second letter was sent to selected teachers who had not answered the questionnaire. As the computer print-out sheet and the additional list of teachers did not state which junior high school contained the ninth grade, a letter was sent to each junior high school principal with a list of the teachers, with the request to identify the ninth grade teachers by an (x) after their name.

In September, 1973, letters were sent to eight teachers who had received their Bachelors degree in 1955 or before, requesting a questionnaire be filled out that would indicate whether or not they had completed additional mathematics courses since the date of their B.A. degree. At this time, letters were also sent to the principals of all the high schools and those junior high schools that had ninth grades. The questionnaires, in an attempt to obtain the topics taught in the classrooms, requested the title of the textbooks, authors, publishers, and copyright dates.

Mrs. Arminda Riser, Director of Research, Caddo Parish School Board, was requested to furnish any information that might be available to document the success of college students from Caddo in universities and colleges. Mrs. Riser was very cooperative and furnished the data requested.

Summary

The libraries of the universities and colleges visited and used in the review of related literature were listed, and the construction of the two questionnaires mailed out to Caddo Parish teachers and principals were described in detail. The method of selection of the names of the teachers to which the questionnaires were to be mailed was discussed. The names of all the national organizations to which a letter requesting information about the most recent set of recommentations were given and the appropriate appendices, if any, were given where the replies could be found. Also, a brief description of the printing of the questionnaire was given, along with the manner of distribution of those questionnaires.

CHAPTER IV

ANALYSIS OF DATA

Introduction

In Chapter IV, the results of the questionnaire mailings were analyzed. The mathematics courses taken by the teachers in Caddo Parish, as indicated on the questionnaires, were used to determine if they qualified by each individual organization's set of recommendations. Two figures were determined in each category, the actual number of teachers who completed the course, and the percentage of teachers who completed the course.

The questionnaires to the principals were used to determine the topics in mathematics taught in each class at each grade level at each school. This information was put in tabular form so that the pattern in each grade could be determined for the whole parish. Finally, the topics taught in the parish were compared with the authorities, to determine exactly what per cent of the topics were recommended by the authorities for that particular grade.

Interpretation of Correlation of Data on Teachers

Of the eighty-eight questionnaires mailed to the secondary mathematics teachers in Caddo Parish, sixty questionnaires, or 68 per cent of the number mailed, were returned. For analysis, the teachers of

secondary mathematics were divided into two groups: those teachers who taught algebra and advanced courses for students who are college bound and are taking the traditional mathematics courses; and those teachers who taught general mathematics and junior and senior mathematics for students who are not necessarily going into college work. There were twenty-nine respondents who did not return their questionnaires. The odds are very high against one of these teachers having had a course in real analysis, and, therefore, being qualified by the CUPM (1971) requirements (one in nine million). See Tables 3 and 4, pages 57-58, for a breakdown of the mathematics training and certification of all Caddo teachers.

An analysis is made, in the following paragraphs, of the qualifications of the Caddo Parish mathematics teachers as determined by each of the eight sets of recommendations for the training of secondary mathematics teachers. The analysis consisted in determining the percentage of Caddo teachers who had credit for each mathematics course in each set of recommendations.

CUPM (1961).--This committee did not list algebra and trigonometry, et cetera, on the list but included these under the word "prerequisites." Calculus is required for three courses in the recommendations. The record of completion of Caddo Parish Mathematics Teachers (CPMT) in this area is as follows: 93 per cent in the first course, 88 per cent in the second course, and 62 per cent in the third course. See Table 5, page 59.

CUPM (1961) listed a first course in linear algebra followed by a second course in abstract algebra. Fifty-three per cent of the teachers completed the first course and 18 per cent completed the

TABLE 3

MATHEMATICS TRAINING OF CADDO HIGH SCHOOL TEACHERS

Hours of Mathematics	Algebra Teachers	Math Teachers
0	0	0
3	0	0
6	0	2
9	0	1
10 - 19	3	2
20 - 29	4	8
30 - 39	16	11
40 - 49	5	1
50 - 59	3	4
60 - 69	0	0
Average Number of Semester-Hours Studied in Mathematics	31	29
Degrees Obtained (Bachelors)		
Major Field		
Mathematics	24	18
Major Field		
Education	4	5
Science	1	0
Other	2	6
Degrees Obtained (Masters)		
Major Field		
Mathematics	4	4
Education	6	5
Other	1	0
Masters Degree plus 30 hrs.	3	1

Source: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

TABLE 4

CERTIFICATION OF CADDO HIGH SCHOOL TEACHERS

Hours of Mathematics	Algebra Teachers	Math Teachers
Field of Certification		
Secondary	28	30
Elementary	1	0
Not Indicated	0	1
Type of Certificate		
Type A (Masters or higher plus 5 years of successful teaching experience)	12	10
Type B (Baccalaureate degree plus 3 years of successful teaching experience)	4	4
Type C (Baccalaureate degree)	10	13
Temporary	2	1
Type of Institution Granting Degrees		
Black	7	11
White	24	18

Source: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

TABLE 5

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF CUPM (1961)

(1) CUPM (1961) Teacher Training Recommendations	(2) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
I. Calculus 1st course	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
2nd course	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
3rd course	x	x			x	x	x	x		x	x	x	x	x	x	x		x		x	x	x	x		x	x		x		
II. Algebra 1st course (linear)	x						x				x				x		x					x		x	x	x			x	
2nd course (abstract)									x																					
III. Probability and Statistics	x	x	x	x			x	x			x	x																	x	
IV. Geometry 1st course	x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
2nd course				x					x		x									x				x						
V. Elect any two of these: 1. Introduction to real variables, 2. Number theory, 3. History of mathematics, 4. Numerical Analysis, and 5. Computer									4		4	4			4					3			3		5 4		5	5	4	

TABLE 5--Continued

(1) CUPM (1961) Teacher Training Recommendations	(2) 31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Completed Course	Percentage
I. Calculus 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	56	93
2nd course	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	53	88
3rd course	x	x		x		x	x	x	x	x		x					x			x		x	x	x				x		x	37	62
II. Algebra 1st course (linear)	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
2nd course (abstract)					x							x			x	x	x						x	x		x		x	x		11	18
III. Probability and Statistics	x		x	x	x			x					x						x	x				x		x	x				20	33
IV. Geometry 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x				x		x	x	x	45	75
2nd course							x							x												x			x		9	15
V. Elect any two of these: 1. Introduction to real variables, 2. Number theory, 3. History of mathematics, 4. Numerical Analysis, and 5. Computer		4			4		5																								1	2
																															Total	439
																															Average	48.78

TABLE 5--Continued

(1)	(2)
CUPM (1961) Teacher Training Recommendations	

Sources: Column 1: Recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics, The Mathematics Teacher, December 1, 1960, pp. 632-38.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

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second course in algebra. Thirty-three per cent of the teachers studied Probability and Statistics and 75 per cent studied Euclidean geometry first course, while 15 per cent studied the second course in Euclidean geometry. Only one teacher had studied the recommended two courses for electives, or 2 per cent.

The percentage column gives the per cent of the sample that completed the course listed on each line. The average of forty-nine for this column gives the average percentage of course completions by CPMT that was recommended by CUPM (1971).

NASDTEC (1961).--The organization cited seven areas of mathematics in which the secondary mathematics teacher should be proficient. This committee recommended algebra and geometry (six hours), and 68 per cent of Caddo teachers had completed this combination. Analytic geometry and calculus were recommended for nine hours. Sixty-two per cent of the Caddo Parish mathematics teachers had studied nine hours in these two subjects. NASDTEC listed modern algebra, and 53 per cent of the teachers had completed a course in this subject. Euclidean geometry was on the list of requirements, and the Caddo teachers had studied this subject to the extent that 75 per cent of the teachers had the course on their record. See Table 6, page 63.

Thirty-three per cent of the teachers in Caddo had studied Probability and Statistics. In the area of Set Theory and Elementary Logic, it had been determined that the Caddo teachers had studied in these areas to the extent that 38 per cent had studied Set Theory and 12 per cent had studied Elementary Logic. The average of the percentage of course completions for NASDTEC (1961) by CPMT was fifty-three.

TABLE 6

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF NASDTEC (1961)

(1) NASDTEC (1961) Teacher Training Recommendations	(2) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Mathematics Major	x	x	x	x	x		x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x			x	
Algebra and Geometry (6 hours)	x	x		x		x	x	x		x	x	x				x					x			x			x	x	x	
Analytic Geometry and Calculus (9 hours)	x	x			x	x	x	x		x	x	x	x	x	x	x		x		x	x	x	x		x	x		x		
Modern Algebra	x						x				x				x		x					x		x	x	x			x	
Euclidean Geometry	x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
Probability and Statistics	x	x	x	x			x	x			x	x																	x	
Topics in Set Theory				x			x	x	x			x		x	x						x			x	x					x
Topics in Elementary Logic							x		x		x													x						

TABLE 6--Continued

(1) NASDTEC (1961) Teacher Training Recommendations	(2) 31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Completed Course	Percentage
Mathematics Major	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x		x	x	x		x	x	x		x	48	80
Algebra and Geometry (6 hours)	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x		x	x	x	x	x		x	x	x	x	x	41	68
Analytic Geometry and Calculus (9 hours)	x	x	x		x		x	x	x	x		x					x			x		x	x	x				x	x		37	62
Modern Algebra	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
Euclidean Geometry	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x				x		x	x	x	45	75
Probability and Statistics	x		x	x	x			x					x						x	x				x		x	x				20	33
Topics in Set Theory	x				x	x						x	x	x										x		x	x	x	x	x	23	38
Topics in Elementary Logic	x					x										x															7	12
																															Total 421 Average 52.63	

Sources: Column 1: National Association of State Directors of Teacher Education and Certification, Guidelines for Preparation Programs of Teachers of Secondary School Science and Mathematics (Washington, 1st ed., 1961), pp. 23-26.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

CUPM (1971).--The committee recommended Calculus for three courses or nine hours. Ninety-three per cent of CPMT completed the first course, 88 per cent completed the second course, and 62 per cent completed the third course. See Table 7, page 66.

No teacher in Caddo had studied the course entitled "Real Analysis." This committee, similar to the 1961 committee, recommended two courses in algebra, one course in linear, and one course in abstract algebra. CPMT's record of completion on these two courses is 53 per cent and 18 per cent, respectively.

Thirty-three per cent of CPMT studied Probability and Statistics and 75 per cent studied Euclidean geometry. Only four teachers took the course in computer, for a percentage of seven. The average of forty-eight is the average percentage of course completions for CUPM (1971) by CPMT.

Bompart (1967).--Bompart's recommendations for teacher training for secondary mathematics teachers listed algebra and trigonometry for three hours as a first requirement on the four-year program. See Table 8, page 68. These teachers completed this course for a percentage rating of 92 per cent. Next on the list was Analytic Geometry for three hours. CPMT finished this course, for a 93 per cent completion record. Calculus was recommended for two courses (or six hours). The Caddo teachers had a record of 93 per cent and 88 per cent completion, respectively, on the two courses.

Bompart recommended two courses in geometry, one in the traditional Euclidean and one in other geometries. Seventy-five per cent of the teachers studied Euclidean geometry, and 15 per cent of the

TABLE 7

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF CUPM (1971)

(1) (2)

CUPM (1971) Teacher Training Recommendations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
I. Calculus 1st course	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
2nd course	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
3rd course	x	x			x	x	x	x		x	x	x	x	x	x	x		x		x	x	x	x		x	x		x		
II. Real Analysis																														
III. Algebra 1st course (linear)	x						x				x				x		x					x		x	x	x			x	
2nd course (abstract)										x																				
IV. Probability and Statistics	x	x	x	x			x	x			x	x																	x	
V. Geometry 1 course Traditional Euclidean	x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
VI. Computer course																									x		x	x		

TABLE 7--Continued

(1) CUPM (1971) Teacher Training Recommendations	(2) 31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Completed Course	Percentage
I. Calculus 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	56	93
2nd course	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	53	88
3rd course	x	x		x		x	x	x	x	x		x					x			x		x	x	x			x		x		37	62
II. Real Analysis																															0	0
III. Algebra 1st course (linear)	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
2nd course (abstract)					x							x			x	x	x						x	x		x		x	x		11	18
IV. Probability and Statistics	x		x	x	x			x					x						x	x				x		x	x				20	33
V. Geometry 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x				x		x	x	x	45	75
VI. Computer course							x																								4	7
																															Total	429
																															Average	47.67

Sources: Column 1: American Association for the Advancement of Science, Guidelines and Standards For the Education of Secondary School Teachers of Science and Mathematics (Washington, American Association for the Advancement of Science, 1971), pp. 1-15.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

TABLE 8

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF BOMPART (1967)

(1) Bompart (1967) Teacher Training Recommendations	(2) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
I. Algebra (3 hrs.)	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	
II. Analytic Geometry (3 hrs.)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
III. Calculus 1st course	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
2nd course	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
IV. Geometry 1st course Traditional Euclidean	x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
2nd course				x					x		x									x				x						
V. Algebra 1st course (linear)	x						x				x				x		x					x		x	x	x			x	
2nd course (algebraic structure)										x																				
VI. Teaching Mathematics	x	x	x	x	x		x	x	x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x		x	

TABLE 8--Continued

(1) Bompart (1967) Teacher Training Recommendations	(2) 31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Completed Course	Percentage
I. Algebra (3 hrs.)	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	55	92
II. Analytic Geometry (3 hrs.)	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	56	93
III. Calculus 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	56	93
2nd course	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	53	88
IV. Geometry 1st course Traditional Euclidean	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x				x		x	x	x	45	75
2nd course							x							x												x			x		9	15
V. Algebra 1st course (linear)	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
2nd course (algebraic structure)					x							x			x	x	x						x	x		x		x	x		11	18
VI. Teaching Mathematics	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x	53	88
																															Total	615
																															Average	68.33

Sources: Column 1: Bompart, Billy Earl. "An Undergraduate Program Based on Certification Requirements," School Science and Mathematics, LXX Number 9, (December, 1970), pp. 805-12.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

teachers studied geometry in other areas than Euclidean. Linear and a course in algebraic structure was, also, recommended by Bompart. CPMT's record in these two courses was 53 per cent and 18 per cent, respectively. Eighty-eight of the teachers had a course in teaching mathematics, which was the last item on the list of Bompart's requirements. The average of the percentage column under Bompart (1967) is sixty-eight. This is the percentage of course completions attained by CPMT under those recommendations.

Midwest College Conference (1968).--The Midwest committee recommended a total of seven courses, starting with college algebra and trigonometry and finishing with Differential Equations. See Table 9, page 71. Seventy-seven per cent of the teachers concerned completed seven or more courses in mathematics in their undergraduate work. Ninety-two per cent of CPMT studied the course in college algebra and trigonometry, and 45 per cent of them had progressed up through Differential Equations. In the field of electives: 33 per cent had completed Statistics, 7 per cent had completed Theory of Equations, 53 per cent had completed Modern Algebra, 13 per cent had completed Modern and Projective Geometry, and 17 per cent had completed Advanced Calculus. The average of the percentage of course completions for Midwest College Conference (1968) by CPMT is forty-six.

CEEB (1969).--The CEEB committee did not recommend any specific number of hours in any specific mathematics subject. The major areas of Calculus, Analytical Geometry, Analysis, Abstract Algebra, Geometry, Statistics, and Logic were recommended, with as many electives in mathematics as possible. See Table 10, page 73.

TABLE 9

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF THE MIDWEST COLLEGE CONFERENCE (1968)

(1)	(2)																																
Midwest College Conference (1968) Teacher Training Recommendations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Mathematics Major	x	x	x	x	x		x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x			x	
Total Courses (Seven recommended)	9	12	8	14	5	5	13	18	12	11	16	17	6	9	12	7	6	5	10	5	7	17	10	10	10	13	7	7	14	2
College Algebra and Trigonometry	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	
Differential Equations	x	x	x	x			x	x	x	x	x	x		x				x								x				
Electives																														
Statistics	x	x	x	x			x	x			x	x																		x
Theory of Equations				x																					x					
Modern Algebra	x						x				x				x		x					x		x	x	x			x	
Modern and Projective Geometry				x							x										x			x						
Advanced Calculus	x						x	x																						

TABLE 9--Continued

(1) Midwest College Conference (1968) Teacher Training Recommendations	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	(2) Completed Course	Percentage
Mathematics Major	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x		x		x	x	x		x	x	x		x	48	80
Total Courses (Seven recommended)	13	9	9	11	20	10	13	10	7	11	2	12	13	12	27	9	11	9	6	14	6	7	11	14	3	12	8	15	10	8	46	77
College Algebra and Trigonometry	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	55	92
Differential Equations	x		x	x		x		x		x			x		x		x		x			x		x		x	x				27	45
Electives																																
Statistics	x		x	x	x			x					x						x	x				x		x	x				20	33
Theory of Equations															x	x															4	7
Modern Algebra	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
Modern and Projective Geometry															x		x				x					x					8	13
Advanced Calculus					x					x		x		x					x				x				x				10	17
																															Total	417
																															Average	46.33

Sources: Column 1: Brown, John A. "Promising Practices in Mathematics Teacher Education." School Science and Mathematics, LXVIII (January, 1968), pp. 25-40.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

TABLE 10

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF CEEB (1969)

(1)	(2)																														
CEEB (1969) Teacher Training Recommendations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Mathematics Major	x	x	x	x	x		x	x	x	x	x	x	x	x	x			x	x	x		x	x	x	x	x			x			
Recommended 30 hours in Major	27	36	24	51	15	15	39	54	36	33	48	51	22	33	36	22	20	36	15	51	21	36	37	32	39	37	22	25	42		6
Analytical Geometry and Calculus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
Analysis	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x			
Algebra (abstract)										x																					
Geometry	x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x		
Statistics	x	x	x	x			x	x			x	x																	x		

TABLE 10--Continued

| (1) CEEB (1969) Teacher Training Recommendations | (2) | | |

Sixty-three per cent of CPMT had thirty hours in mathematics or more. Ninety-three per cent of the teachers under discussion had completed the course in Analytical Geometry and Calculus. Also, 95 per cent of the teachers had courses in Analysis. Eighteen per cent had completed the course in Abstract Algebra. Geometry, other than Analytical Geometry, and Statistics had been completed by CPMT for a completion record of 75 per cent and 33 per cent, respectively. The average of the percentage column under CEEB (1969) is sixty-five. This is the average percentage of course completions attained by CPMT under these recommendations.

NASDTEC (1971).--The first recommended course, by this committee, was Algebra for three hours. Ninety-two per cent of the Caddo teachers had completed this course (see Table 11, page 76). Seventy-five per cent of the teachers had completed the next recommended subject of Geometry. The three courses in Analytical Geometry and Calculus had been completed by CPMT for a record of completion of 93 per cent, 88 per cent, and 62 per cent in each category. Linear and Abstract Algebra had been studied by 53 per cent and 18 per cent of the teachers, respectively. CPMT had a record of 33 per cent in first course Probability and Statistics. Forty-five per cent of the teachers completed Differential Equations. The average of the percentage of course completions for NASDTEC (1961) by CPMT is fifty-nine.

NCTM (1972).--The National Council of Teachers of Mathematics Committee did not list their requirements as semester-hours spent in a particular subject, but listed mathematical abilities and skills desired (see Table 12, page 78). The skills and abilities listed in

TABLE 11

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF NASDTEC (1971)

(1) NASDTEC (1971) Teacher Training Recommendations		(2) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
I. Algebra (3 hrs.)		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	
II. Geometry (3 hrs.)		x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
III. Analytical Geometry & Calculus	1st course	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2nd course	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
	3rd course	x	x			x	x	x	x		x	x	x	x	x	x	x		x		x	x	x	x		x	x		x		
IV. Algebra 1st course (linear)		x						x				x				x		x					x		x	x	x			x	
2nd course (abstract)												x																			
V. Probability and Statistics		x	x	x	x			x	x			x	x																	x	
VI. Geometry 1st course		x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
2nd course					x					x		x									x				x						
VII. Differential Equations		x	x	x	x			x	x	x	x	x	x		x				x								x				

TABLE 11--Continued

(1) NASDTEC (1971) Teacher Training Recommendations	(2) 31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Completed Course	Percentage
I. Algebra (3 hrs.)	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	55	92
II. Geometry (3 hrs.)	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x			x	x	x					x		x	x	x	45	75
III. Analytical Geometry & Calculus 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	56	93
2nd course	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	53	88
3rd course	x	x		x		x	x	x	x	x		x					x			x		x	x	x				x		x	37	62
IV. Algebra 1st course (linear)	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
2nd course (abstract)					x							x			x	x	x						x	x		x		x	x		11	18
V. Probability and Statistics	x		x	x	x			x					x						x	x				x		x	x				20	33
VI. Geometry 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x				x		x	x	x	45	75
2nd course							x							x												x			x		9	15
VII. Differential Equations	x		x	x		x		x		x			x		x		x		x			x		x		x				x	27	45
																															Total	649
																															Average	59.0

Sources: Column 1: National Association of State Directors of Teacher Education and Certification, Guidelines for Preparation Programs of Teachers of Secondary School Science and Mathematics (Washington, 2d ed., 1971), pp. 21-25.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

TABLE 12

COMPARISON OF THE BACKGROUND OF EACH CADDO PARISH MATHEMATICS TEACHER WITH THE RECOMMENDATIONS OF NCTM (1972)

(1) NCTM (1972) Teacher Training Recommendations	(2) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
I. Calculus 1st course	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
2nd course	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
3rd course	x	x			x	x	x	x		x	x	x	x	x	x	x		x		x	x	x	x		x	x		x		
II. Algebra 1st course (linear)	x						x				x				x		x					x		x	x	x			x	
2nd course (abstract)										x																				
III. Probability and Statistics	x	x	x	x			x	x				x	x																x	
IV. Geometry 1 course Traditional Euclidean	x	x		x			x	x	x	x	x	x	x	x		x		x		x	x	x	x	x	x	x	x	x	x	
V. Computer Course																									x		x	x		

TABLE 12--Continued

(1) NCTM (1972) Teacher Training Recommendations	(2) 31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	Completed Course	Percentage
I. Calculus 1st course	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	56	93
2nd course	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	53	88
3rd course	x	x		x		x	x	x	x	x		x					x			x		x	x	x			x		x	37	62
II. Algebra 1st course (linear)	x	x	x		x	x	x	x		x		x	x	x	x	x	x	x	x	x				x		x		x	x	x	32	53
2nd course (abstract)					x							x			x	x	x						x	x		x		x	x		11	18
III. Probability and Statistics	x		x	x	x			x					x						x	x				x		x	x				20	33
IV. Geometry 1 course Traditional Euclidean	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x				x	x	x				x		x	x	x	45	75
V. Computer Course							x																								4	7
																															Total	429
																															Average	53.63

Sources: Column 1: New York University, School of Education. Personal correspondence between Stephen S. Willoughby, Head, Division of Science and Mathematics, and the writer. n.d.

Column 2: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

the requirements were translated into appropriate courses to be checked off against the CPMT.

Ninety-three per cent of CPMT completed the first course in Calculus. Eighty-eight per cent of the teachers completed the second course, and 62 per cent completed the third course. In Linear Algebra the record of completion was 53 per cent, and in Abstract Algebra 18 per cent completed the course. CPMT studied Probability and Statistics for a record of completion of 33 per cent and Geometry for a record of completion of 75 per cent. Only 7 per cent of the teachers had studied a computer course. The average of the percentage of course completions for NCTM (1972) by CPMT was fifty-four.

A Composite of All Recommendations

Since there was no national standard of teacher preparation in the United States of America, it was decided to formulate such a standard from all the published sets of recommendations by national mathematical organizations. Thus, the subproblem of how to determine the national standard was resolved.

In an effort to formulate a set of recommendations that would be a composite of all the nationally published requirements by the mathematical associations, attention was focused on each area of mathematics that was suggested by the associations for secondary mathematics teachers. If more than 50 per cent of the organizations advised the mastery of a certain mathematical subject or the completion of a certain number of hours in a subject; then, it was determined that it would be included in the composite recommendations.

In the area of calculus, the CUPM (1971) requirement of three courses was substantiated by all the recommendations but one, and that

was by Bompart in 1967. Therefore, the composite list would include three courses in Calculus. In Real Analysis, no other organization besides CUPM (1971) deemed it a necessary requirement; thus, it was not a composite requirement. The requirement by the CUPM (1971) Committee in algebra, of one course in linear and one course in abstract, was also recommended by all organizations but NASDTEC (1961). The composite recommendations would require two courses in algebra. Probability and statistics was a requirement of all the recommendations, with the exception of Bompart (1967). The composite list would require one course in probability and statistics, as most recommendations required it. One course in geometry (Euclidean) would be included because all of the associations recommended it.

The CUPM (1971) recommendations required a computer course such as BASK or FORTRAN. Only NCTM (1972) made the computer course a requirement. Therefore, by the criteria of what was to be included in the composite and what was not to be included, the composite recommendations would not include the computer course.

Thus, the courses required on the composite recommendations of the national mathematical organizations are as follows:

Calculus	9 hours
Algebra	6 hours
Probability and Statistics	3 hours
Geometry (Euclidean)	3 hours
Total	21 hours

On the composite requirements, the teachers in Caddo Parish completed the courses as follows:

Subject	Percentage Completed
Calculus 9 hours	61%
Algebra 6 hours	19%
Probability and Statistics 3 hours	34%
Geometry 3 hours	75%

In further determining the qualifications of the teachers of Caddo Parish, a comparison was made of the mathematical background of each individual teacher with the recommendations of the associations cited in the review of related literature, and the results (in terms of deficiencies) were as follows:

CUPM (1961) recommendations required two courses in abstract algebra, and no teacher in Caddo Parish had two courses in abstract algebra. NASDTEC (1961) recommended a course in physics, and this was not revealed in most cases by the questionnaire of this study, as only individual courses in mathematics were requested. Bompart (1967) recommended probability and statistics and linear algebra, and only approximately 33-1/3 per cent of the teachers of Caddo Parish have had all the recommended courses.

Midwest College Conference (1968) definitely recommended differential equations and a core of seven courses. Only 33 per cent of the Caddo Parish teachers had the required courses. CEEB (1969) stressed statistics and abstract algebra, and only 3 per cent of the Caddo teachers had this combination. NASDTEC (1971) stressed abstract algebra and field and laboratory experience in using probability. No teacher in Caddo Parish had the extensive experience in statistics that was required in these recommendations. No teacher in Caddo had the course in Real Variables recommended by CUPM (1971). The recommendations of NCTM for 1972 were consistent with the recommendations of CUPM (1971) and, therefore, no teacher in Caddo qualified.

Tables 13 and 14, pages 83 and 84, show the date the Bachelors and the Masters degree were conferred upon the individual teachers in Caddo Parish. Of the total number of respondents, forty-eight or

TABLE 13

THE DATE OF THE AWARDING OF THE BACHELORS DEGREE TO CADDO MATHEMATICS TEACHERS

Year	Number	Percentage of Sample
1971-73	8	13
1965-70	20	34
1960-64	13	22
1955-59	8	13
1950-54	5	8
1945-49	4	7
1940-44	2	3
Total	60	100%

Source: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

TABLE 14

THE DATE OF THE AWARDING OF THE MASTERS DEGREE TO CADDO MATHEMATICS TEACHERS

Year	Number	Percentage of Sample
1971-73	5	8
1965-70	7	12
1960-64	5	8
1955-59	0	0
1950-54	0	0
1945-49	1	2
1940-44	0	0
Total	18	30%

Source: Based on questionnaire survey of Caddo Parish mathematics teachers conducted in Fall of 1972.

80 per cent had received the Bachelors degree after 1955. The year 1955 is the date that was determined as the dividing point between those mathematics degrees having the modern approach and those not having the modern approach to mathematics. It was conceded that there would probably not be unanimous consent on this date; however, it was also felt that any student in mathematics after 1955 would have had ample opportunity to study the more recent mathematics courses. See Appendix A for questionnaire concerning the upgrading of mathematical skills.

The questionnaires revealed that twelve teachers received the Bachelors degree before 1955. Four of the twelve teachers had received their Masters degree with a major or minor in mathematics in the sixties or seventies. It was thought that any person studying toward a major or minor in mathematics at the graduate level, at this time, would be exposed to the modern approach in mathematics. The remainder, or eight (13 per cent), received their Bachelors degree before 1955 and had not taken additional work to upgrade their mathematics abilities.

The algebra teachers, as a group, were more qualified than the mathematics teachers to teach secondary mathematics because they had more hours in the subject and more mathematics majors in undergraduate college work. The average number of semester-hours studied in mathematics for the algebra teachers in Table 3, page 57, was drastically reduced by several individual teachers who had less than ten hours of college credit in mathematics. Also, there were individual algebra teachers, at the time of this study, who did not have a minor in mathematics and were definitely not qualified to teach secondary mathematics, even according to state standards.

The mathematics teachers have less hours in college mathematics than the algebra teachers and a lesser number of them are mathematics majors. In this group, also, there were individual teachers who did not have a minor in mathematics and were not qualified to teach secondary mathematics.

As seen in Table 3, page 57, the teachers in the algebra group have thirty-four teachers who have earned thirty to sixty-nine hours of mathematics. The teachers in the mathematics group have only seventeen in this same category.

In the sample of sixty questionnaires returned, thirty-one were from algebra teachers, and twenty-nine were from mathematics teachers. Twenty-four algebra teachers have the Bachelors degree in mathematics (77 per cent), and seven algebra teachers do not have the Bachelors degree (23 per cent). Eighteen mathematics teachers have the Bachelors degree in mathematics (62 per cent), and eleven do not possess the Bachelors degree (38 per cent).

One of the expressed purposes of this study was to determine if the teachers were up-to-date in their mathematics preparation. In Table 3, page 57, it was found that eight teachers of the sample (13 per cent), had degrees that had not been improved by taking additional college courses in mathematics after the B.A. was taken and could, therefore, be described as out-of-date.

Interpretation of Correlation of Data on Curriculum

Analysis of curriculum.--From the survey of the fourteen junior high schools and senior high schools, it was determined that in first year algebra, ninth grade level, all the schools taught the subject

from the same textbook and, therefore, the same topics were taught. In General Mathematics, ninth grade, Phase I, all schools, without exception, taught the same subjects. The same was true for general mathematics, ninth grade, Phase II. All fourteen schools taught the same subjects in Phase II.

The Elements of Geometry, taught at the tenth grade level, was the same in all of the senior high schools. As the textbook was by the same publisher and author, the topics were the same.

Eleventh and twelfth grade Senior Arithmetic, Phase I, was similar in all schools with the same topics being taught, but not necessarily from the same textbooks. In Phase II of the same subject it was, likewise, found that all high schools taught the same topics.

In the Advanced Mathematics Course, five of the high schools studied one set of subjects from a book entitled Modern Introductory Analysis (see Table 25, page 190). The other two schools only studied from Modern Algebra and Trigonometry Book 2 for the advanced course. All schools used this book for Algebra II at the eleventh grade level.

The results were not unexpected, as the parish must select the textbooks from a state-approved list. Another reason to expect uniformity in textbooks was the survey of the Parish school system by the Peabody personnel.

Tables, numbers 18 to 25, pages 173-190, present the results of a questionnaire survey that was made of all the junior and senior high schools in Caddo Parish in the Fall of 1973. Table 15, page 88, gives the comparison of the topics taught in the various grade levels with those topics recommended by CEEB and SMSG for college-bound students.

TABLE 15

COMPARISON OF THE TRADITIONAL SECONDARY MATHEMATICS COURSES OFFERED IN CADDO PARISH SCHOOLS WITH THE RECOMMENDED COURSE BY CEEB* AND SMSG**

(1)	(2) CEEB	(3) SMSG
First Year Algebra (Ninth Grade)		
Topics:		
Symbols and Sets		x
Variables and Open Sentences		x
Axioms, Equations and Problem Solving	x	x
The Negative Numbers	x	x
Equation, Inequalities and Problem Solving	x	x
Working With Polynomials	x	x
Special Products and Factoring	x	x
Working with Fractions	x	
Graphs		x
Sentences in Two Variables	x	
The Real Numbers		x
Function and Variation	x	x
Quadratic Equations and Inequalities	x	x
Geometry and Trigonometry	x	
Elements of Geometry (Tenth Grade)		
Topics:		
Induction, A Method of Discovery	x	x
Deduction and Proof	x	x
Angle Relationships: Perpendicular Lines	x	x
Parallel Lines and Planes	x	x
Congruent Triangles	x	x
Similar Polygons	x	x
Trigonometry		
Circles, Areas, and Angles	x	x
Constructions and Loci	x	x
Coordinate Geometry--Methods	x	x
Coordinate Geometry--Proofs	x	x
Areas of Polygons and Circles	x	x
Areas and Volumes of Solids	x	x
Algebra II (Eleventh Grade)		
Topics:		
Sets of Numbers, Axioms	x	x
Open Sentences in One Variable	x	x
System of Linear Open Sentences	x	x
Polynomials and Factoring	x	x
Rational Numbers and Expressions	x	x
Relations and Functions	x	x
Irrational Numbers and Quadratic Equations	x	x
Quadratic Relations and Systems	x	x

TABLE 15--Continued

(1)	(2) CEEB	(3) SMSG
Advanced Mathematics (Twelfth Grade)		
Topics:		
Exponential Functions, Logarithms	x	x
Trigonometric Identities and Complex Numbers		
Trigonometric Identities and Formulas		
The Circular Functions and Their Inverses		
Progressions and Binomial Expansions		
Polynomial Functions	x	x
Matrices and Determinants		x
Permutations, Combinations, and Probabilities		
Modern Introductory Analysis (Sequence)		
Topics:		
Statements and Sets in Mathematics	x	
Ordered Fields	x	
Mathematical Induction		
Sequences and Series		
The Algebra of Vectors		
Plane Analytic Geometry of Points and Lines		
Functions	x	
The Field of Complex Numbers		
Graphs of Polynomial Functions	x	
Exponential and Logarithmic Functions	x	
The Circular Functions and Trigonometry		
Properties of Circular and Trigonometric Functions		
Vectors, Trigonometry, and Complex Numbers		
Analytic Geometry and Matrices		x
Space Geometry		
Probability		x

Sources: Column 1: Based on questionnaire survey of Caddo Parish principals conducted in Fall of 1973.

Columns 2 and 3: The CEEB and SMSG selections are based on John J. Kinsella, Secondary School Mathematics (New York: The Center for Applied Research, Inc., 1965), pp. 46-67.

*CEEB - College Entrance Examination Board
**SMSG - School Mathematics Study Group

The non-college bound student is referred to as a "Career Student." These students are placed in different phases according to various criteria. See Appendix G for the details of the criteria. The phase programs are constructed so as to give all ninth grade students, of whatever level of ability, the opportunity to study applications to life situations as recommended by the Joint Commission of the Mathematics Association of America and the National Council of Teachers of Mathematics. See page thirty-four of this study for the details. Also, the second course in General Mathematics is phased so that all levels of students may be taught those mathematics subjects, at their level of ability, that would tend to close the space between the mathematics competence of the average citizen and that which was required to successfully cope with the environment.

It was found that for college-bound students, CEEB and SMSG recommended 80 per cent of the topics taught in all Caddo classrooms. The broad general area of activity in general mathematics was favorably compared to the recommendations of the organizations listed who made recommendations in general mathematics.

Standing of Students

Table 16, page 91, presents the mathematical percentile mean scores for senior students in Caddo Parish in 1969 and 1972. In 1969 the mean percentile of the white students fell on the 45th percentile, and the mean percentile of the black students fell on the 5th percentile. In 1969 the school system was a dual system, and in 1972 the school system was a unitary school system. In 1972, the first class graduated that had gone through three years of integrated classroom instruction.

TABLE 16

STANDARDIZED TEST RESULTS OF CADDO
PARISH HIGH SCHOOL STUDENTS

Below are the mathematical percentile mean scores for students in Caddo Parish in the categories indicated:

Twelfth Grade (12.7) Means Mathematics
Percentiles on Standardized Tests

1972 - N = 3097
Total mean scores fell on 25th percentile

1969 - N = 3186
White students fell on 45th percentile
Black students fell on 5th percentile

Source: Based on personal correspondence between Mrs. Arminda Riser, Supervisor of Guidance and Research, Caddo Parish School Board, and the writer. See Appendix C.

TABLE 17

COLLEGE RECORD OF FRESHMEN FROM
CADDO PARISH HIGH SCHOOLS
1965 GRADUATES

RACE	NO. STUDENTS	A	B	C	D	F	TOTAL SUBJECTS
White	1,088	15.1%	30.1%	34.3%	11.9%	8.6%	
		1521	3038	3471	1206	872	10,108
Black	78	23.1%	27.1%	28.3%	11.3%	10.2%	
		98	115	120	48	43	424

Source: Based on personal correspondence between Mrs. Arminda Riser, Supervisor of Guidance and Research, Caddo Parish School Board, and the writer. See Appendix C.

Both teachers and students were integrated. In 1972 the total mean scores of all students fell on the 15th percentile.

The college-bound students were being prepared by the secondary mathematics program in Caddo Parish to cope with college courses. Table 17, page 92, shows the breakdown on Caddo Parish students in colleges according to grades received in their freshman year in the colleges and universities of Louisiana. The last year available was 1965, and no further figures were available, according to school authorities, because the colleges stopped cooperating with the local school system in maintaining a record of the progress of Caddo students in colleges and universities (see Appendix C).

The grades given in the tables were from all courses, not just mathematics, and if plotted, would form a normal bell-shaped distribution pattern. Therefore, the conclusion that could be drawn was that the students from Caddo Parish established a normal grade curve when attending local colleges and universities. No comparable list of grades are available for career students, or students who go on to jobs and technical schools or business schools. The only scores available on these students are the ones that are made in high school.

Summary

In Chapter IV the results of the questionnaires were used to make a tabulation which was analyzed. The mathematics background of the CPMT was analyzed to show how many teachers had completed the designated courses of the various sets of recommendations.

The questionnaires from the principals were used to determine what topics were taught in all the mathematics classes in all the

schools in Caddo Parish. The topics, as determined by the questionnaires, were compared to the recommendations of the authorities.

Teacher training recommendations.--An analysis was made of each set of recommendations from the standpoint of how many teachers had studied the recommended subjects, et cetera. A brief summary of this analysis is:

CUPM (1961). Ninety-three per cent in calculus was the largest percentage of completions, with 2 per cent being the lowest percentage in the required electives. Forty-nine is the average of the course completions.

NASDTEC (1961). The largest percentage of course completions was 75 per cent in Euclidean Geometry, and the lowest percentage was 12 per cent in Elementary Logic. The average of the course completions was fifty-three.

CUPM (1971). Under these recommendations, CPMT attained a high rate of completion of 93 per cent in Calculus, first course, and a low rate of 7 per cent in the computer course. Forty-eight per cent is the average of the course completions.

Bompart (1967). CPMT accomplished a 93 per cent completion mark in Analytic Geometry and first course Calculus to be the highest percentage in this set of recommendations. The course in algebraic structure was the lowest percentage with a figure of eighteen. The average of the course completions under Bompart (1967) is 68 per cent.

The Midwest College Conference (1968). Ninety-two per cent of the teachers in the sample completed College Algebra and Trigonometry.

Only four teachers studied Theory of Equations for a percentage of seven. The average of the column of percentage is forty-six.

CEEB (1969). The course in Analytical Geometry and Calculus was studied by 93 per cent of the teachers for the highest percentage under these recommendations. The course in abstract algebra was studied by only eleven teachers for an 18 per cent, which is the lowest percentage earned under these recommendations. The average of the percentage course completion is sixty-five.

MASDTEC (1971). The first course in Analytical Geometry and Calculus was completed by 92 per cent of CPMT for the highest rate under these recommendations. The second course in Geometry was only completed by nine teachers for a percentage rate of fifteen. The average of the column of percentage is fifty-nine.

NCTM (1972). CPMT attained a percentage of ninety-three on the first course in Calculus for the highest rate. The teachers only attained 7 per cent in the study of a Computer Course. The average of the percentage of course completions for NCTM (1972) by CPMT is fifty-four.

Curriculum.--From the questionnaires sent to the principals, it was ascertained that ninth grade algebra was taught from the same textbook throughout the parish. This was also true for General Mathematics in both Phase I and Phase II.

All senior high schools taught geometry from the same textbook. Senior Arithmetic, Phase I, throughout the parish, was not taught from the same textbook, but an attempt was made to cover the same topics. Phase II, Senior Arithmetic, throughout the parish, covered the same topics.

All schools used Modern Algebra and Trigonometry Book 2 for Algebra II at the eleventh grade level. In Advanced Mathematics, five of the high schools studied from one book entitled Modern Introductory Analysis. The other two schools studied from Modern Algebra and Trigonometry Book 2.

Standing of students.--Statistics were presented which gave the standing of black and white students before integration and after integration. Figures also were given of the grades received by Caddo Parish students in their freshman year in colleges and universities of Louisiana.

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND CONCLUSIONS

Introduction

The purpose of Chapter V was to summarize each chapter of the study, along with each important section. The bringing together of all the summaries of all the chapters enabled the reader to see what each part contributed to the study as a whole. Then, the areas of particular interest were summarized from the entire study.

Recommendations, which were the results of the study, were given, along with generalizations which were obvious from the study. Conclusions were also given. These conclusions came as answers to the problems and subproblems raised by the study.

Summary

In Chapter I, Statement of the Problem, the problem was stated and defined. Chapter II, The Review of Related Literature, set forth the recommendations of the various national mathematical organizations revealed by a review of related literature and inquiries mailed to current addresses of selected organizations.

In Chapter III, Procedures, the activities of initiating a survey of the mathematics teachers in Caddo Parish, Louisiana, and concluding it were described. In Chapter IV, Analysis of Data, the information of the questionnaires as pertaining to the mathematical training of the

teachers and to the topics taught in Caddo Parish mathematics classrooms, was tabulated and compared to the recommendations of the appropriate authorities.

Summary of Training of the Secondary Mathematics Teacher

In summary, in the preceding chapters, conclusive evidence was presented that only 19 per cent of the mathematics teachers of Caddo Parish completed all the subjects on the composite recommendations of the national mathematical organizations. Therefore, it can be said that a majority of 81 per cent did not qualify by these recommendations.

In comparing the mathematical training of the mathematics teachers of Caddo Parish with each individual set of recommendations by national organizations in Chapter IV, the percentages were, in decreasing order: Bompart (1967), 68 per cent; CEEB (1969), 65 per cent; NASDTEC (1971), 59 per cent; NCTM (1972), 54 per cent; NASDTEC (1961), 53 per cent; CUPM (1961), 49 per cent; CUPM (1971), 48 per cent; and Midwest College Conference (1968), 46 per cent. The average of these percentages was 55 per cent. These figures represented the percentage of mathematics courses completed by CPMT of the recommended courses in each set of recommendations.

From the first questionnaire mailed to teachers, it was determined in Chapter IV that twelve teachers received the Bachelors degree before 1955. These teachers were the ones who would be teaching outdated mathematics. Four of these teachers eventually earned a major or minor in mathematics at the graduate level. The remainder, or eight, had received their Bachelors degree before 1955 and had not taken additional work to upgrade their mathematics abilities.

Summary of Curriculum

In Chapter II, recommendations of two outstanding authorities in the field of secondary mathematics, CEEB and SMSG, were presented in detail. These details spelled out the suggested topics that should have been taught in Caddo Parish schools from day-to-day. From a questionnaire survey of all the high schools in the Parish, the topics were secured that were being taught in the classrooms at the time of this study. Then, a correlation was made to determine exactly which topics were taught in Caddo Parish that were recommended by these two organizations.

In summary, it was found that 80 per cent of the topics taught college-bound students in the high schools of Caddo Parish were those topics recommended by CEEB and SMSG. This was determined by comparing the desired topics against those topics actually taught in the classrooms.

No percentage breakdown was possible for general mathematics, as instructional material in those areas was determined by phases. Students were assigned to phases by ability. Thus, each student, at his own level of ability, was instructed how to compete favorably with his environment, which were the recommendations of the authorities in this field.

Summary of Standing of Students

Statistics from the Caddo Parish School Board gave the standing of Caddo Parish twelfth-grade students on national mathematical achievement tests. Prior to integration, the black student achieved at the 5th percentile level and the white student achieved at the 45th percentile

level. After court-ordered integration, the total student body achieved at the 25th percentile level.

Recommendations

Training of the secondary mathematics teacher.--It is recommended that a committee composed of qualified experienced mathematics teachers be formed by the Superintendent in Caddo Parish to review the status of teacher preparation and the implications for that training considered essential, but lacking by the professional organizations cited in this study. References to these courses can be found in Tables 7 and 12, pages 66 and 78.

The primary purpose of this committee would be to determine:

If these recommendations should have an influence on Parish policy in regard to requirements for future mathematics teachers; and if so, to what extent.

It is recommended that those Caddo teachers who received their Bachelors degree before 1955 and have not taken courses to update their knowledge should be required to take some modern mathematics courses. The number of refresher courses and the time and place should be determined by Caddo Parish school officials knowledgeable in the mathematics area.

Curriculum.--It is recommended that the topics taught in the classrooms of college-bound students in Caddo Parish be those recommended by outstanding authorities. At the present, only 80 per cent of the topics taught in the classrooms to college-bound students are recommended by the authorities. This percentage should be increased as the content is kept relevant and current with the times.

In the general mathematics area, as the Peabody College survey team stated, there should be constant evaluation. Content of all courses at all levels should be kept up-to-date and relevant. In many cases, the general mathematics student will be entering the business world in a very short time, and these courses will be his only background in mathematics. Although Caddo Parish has a program of phasing that attempts to reach each student at his own level of intelligence and capabilities, it is especially important that any new adaptation in this area which is the result of research by accepted authorities be investigated and attempted, if found academically sound.

Standing of students.--Because of the 5th percentile score of black students before integration and the subsequent drop by all students to the 25th percentile after integration, the following is recommended:

In the event that a study of an item analysis of the standardized achievement test shows that students lack basic skills to successfully enter high school mathematics courses; it is recommended that a remedial mathematics program be developed to assist in developing the entering competency of all students.

It is also recommended that as a result of this drop in the percentile ranking of secondary mathematics students that a thorough study be made of the preparation and background of secondary mathematics teachers in the Parish to determine the reasons for this drop in percentile ranking. If it can be shown that teachers with substandard qualifications taught students who scored considerably below the percentile ranking in 1969-72, then an instructional improvement program should be instituted by the Parish School Board for these teachers. This program for teachers would be recommended to improve

teaching skills found to be deficient in the areas identified through an analysis of the standardized mathematics test referred to previously.

What mathematics courses should a future teacher select?--The prospective teacher of secondary mathematics should study college algebra as a first course because it is the basis of all higher mathematics courses. To make the assumption that sufficient algebra had been studied in high school would be erroneous because, however many courses had been pursued, the learning situation, in most cases, was not rigorous enough to satisfy college requirements. Thus, to omit first year college algebra would be to provide a base that is not solid enough for further work in mathematics. However, if through a College Level Examination Program, it was found that a student was competent in the fundamentals of algebra, then the first course could be omitted.

The geometry taught in high school classes, for the most part, is Euclidean, and a prospective teacher needs a course at the college level to make a better teacher in the subject. Omission of the Euclidean course in geometry would handicap the future teacher.

With the completion of the algebra and geometry, the student would be at the end of the freshman year. Traditionally, the student goes into analytics and calculus in his sophomore year. Different colleges and universities have different approaches to analytics and calculus. Some institutions have separate courses in analytics and calculus, and some have the two subjects integrated into the same course. For a good many years, some colleges were of the opinion that six hours of the subject were sufficient; however, state universities and others have required nine hours for the Bachelors degree. Presently,

only nine hours would be sufficient. Six hours in analytics and calculus would be a deficiency in a very important course.

Statistics is a very important subject, and the future secondary teacher should take at least one course in his undergraduate schedule, as it is becoming more prevalent in high school work. If the student could start analytics and calculus, as is traditional in the sophomore year, and could possibly work statistics in as an elective, he would be accomplishing a great deal.

The prospective mathematics teacher should strive to take as many courses in his major subject as can possibly be scheduled, along with the degree requirements, starting with the sophomore year. Aside from the subjects that require prerequisites, there are mathematics courses which can be scheduled which do not require prerequisites at the sophomore and junior level.

Toward the end of the sophomore year the student must diligently plan ahead to get the required number of mathematics courses by graduation. With the completion of the analytics and calculus, the sophomore year ends and the junior year's schedule must be determined. If statistics had been taken in the sophomore year, then the student could select from another course in geometry or linear algebra, computer course, or theory of equations. This would leave for the senior year the subjects of abstract algebra and differential equations, and courses not completed at junior level. Six hours in linear and abstract algebra is definitely desirable. The student has the choice of leaving differential equations, et cetera, until graduate school if he does not get to them in his senior year. However, it is desirable that he get as much as he can complete in undergraduate school.

The future mathematics teacher should make sure that in the thirty hours of preparation in the major, the following subjects, which are similar to the recommendations of CUPM (1971), should be studied to the extent indicated:

Algebra	6 hours
Calculus	9 hours
Geometry	3 hours
Probability and Statistics	3 hours
Real Analysis	3 hours
Computer Use	Experience

To get a bare minimum of hours in the major subject with a good many mathematics courses in areas other than those recommended would insure that the student would probably have to get the required subjects in graduate school. Thus, it is imperative that the student carefully select his courses with this in mind.

Generalizations and Conclusions

It was necessary to restate the preliminary problems and subproblems basic to the major purpose of the study before giving the conclusions:

1. Were the teachers in Caddo Parish, Louisiana, adequately educated in mathematics, from the national viewpoint, to be declared qualified to teach secondary mathematics?

2. Were the courses offered to students in secondary mathematics in Caddo Parish comparable to those recommended by recognized authorities in the field of secondary mathematics?

The subproblems of the study were:

1. How was a national standard to be determined?

2. What national association's recommendations were to be used as a basic pattern with which to compare the training of the teachers of Caddo Parish, Louisiana?

Training of the secondary mathematics teacher.--The first of the preliminary problems which had to do with the education of the Caddo Parish teachers and the qualifications to teach secondary mathematics was answered decisively. The evidence presented in the preceding chapters indicated that the majority of the mathematics teachers in Caddo Parish, Louisiana, were not qualified from the national standpoint to teach secondary mathematics. From the summary, the percentage of teachers qualified on the composite of recommendations was 19 per cent, and those not qualified was 81 per cent. The percentage of teachers who were qualified by the individual national associations ranged from 46 per cent to 68 per cent. By either scale, a large majority of the teachers were unqualified.

Therefore, from the preceding paragraph, it can be definitely stated that the majority of the mathematics teachers in Caddo Parish were not qualified to teach secondary mathematics. This statement was based on statistics presented in the previous chapters, which was one of the basic reasons for this study.

There were eight teachers who had received their B.A. degree before 1955 and had not taken any college course in mathematics or had not attended any science or math institute to upgrade their abilities. No questions were asked about mathematics in-service programs to upgrade mathematics abilities or individual self-improvement efforts. Therefore, those teachers who had not taken formal courses in modern

mathematics or had not improved their knowledge through in-service programs or self-improvement study, et cetera, could be said to be teaching outdated mathematics.

The first of the subproblems was resolved in the study by developing a composite of all national organization's recommendations which was to be used as a national standard. Also, the mathematics background of CPMT was compared with each set of recommendations.

The second of the subproblems was also resolved. In the development of the problem, the selection of a set of recommendations was accomplished, and the reasons for the selection were specifically set forth in Chapter II.

Curriculum.--The second of the preliminary problems which had to do with the curriculum offered to students in Caddo Parish as compared to the recommendations of the authorities was, also, answered decisively. The evidence presented in the previous chapters indicates that the topics presented in the classrooms of college-bound students of Caddo Parish were recommended by the authorities in 80 per cent of the cases.

In general mathematics and business arithmetic courses, the area of study at each grade level was in conformity with the recommendations of the authorities. The recommendations of these authorities were discussed in Chapter II of this dissertation.

Standing of students.--Evidence was presented in Chapter IV that the college-level students from Caddo Parish, as a whole, were achieving at the normal grade curve in Louisiana colleges and uni-

versities. It was also pointed out that no statistics were available on the career student after he left high school.

Statistics supplied by the Caddo Parish School Board indicated that before court-ordered integration, black students achieved at the 5th percentile level, and white students achieved at the 45th percentile level on national mathematics achievement tests. After integration, the entire student body achieved at the 25th percentile level. By definition, the national median for high school seniors on this test was at the 50th percentile level. From the above statistics, it can be stated that there is a segment of the secondary school population whose mathematics needs are not being met by the mathematics program of the Caddo Parish School Board.

Summary

In Chapter V, the entire study was summarized. Recommendations and conclusions were also made in each area of the study under consideration. All the problems and subproblems not resolved in the development of the study were completely and clearly answered, based on the statistics presented in the study.

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APPENDIX A

APPENDIX A

2766 Amherst Street
Shreveport, Louisiana 71108
November, 1972
Home Telephone Number: 635-8822

Dear Colleague:

This past summer I attended Walden University in Naples, Florida, where I was enrolled in the doctoral program in Education. As you may know, to complete the requirements for an advanced degree, a research paper is required.

I chose as my research problem the mathematics program and the Mathematics teachers in Caddo Parish. I feel, as I know you do, that the mathematics education the children get in Caddo Parish is vital to their success in their future life.

What I propose to do in my study is to review the current standards of secondary education by the outstanding authorities and compare the program offered in Caddo Parish with these recommendations. By the use of a questionnaire, I propose to compare the sample taken from the mathematics teachers in Caddo Parish with the preparation of the ideal teacher as formulated by the leading authorities and professional organizations. From these comparisons, I hope to draw conclusions and make recommendations.

Naturally, before starting such a study, I secured the permission of Mr. Kennedy, the parish superintendent. I sent him a detailed outline of my proposed study from Florida, and upon my return I discussed the study with Mr. Gregory on the phone, and he assured me that the study would be permitted.

I am of the opinion that Caddo Parish is as up-to-date as any comparible system in the state. I am proud to teach in Caddo, as I know you are. At present I am an algebra teacher at Woodlawn High School. I have taught in the following schools in the past: Rodessa High School, Broadmoor Junior High School, Youree Drive Junior High School, Hamilton Terrace High School, Ridgewood Junior High School, and Walnut High School, and in that order.

From my experiences in the Parish, I expect to find some strengths as well as some weaknesses. However, I will need your help. I hope that you will take five minutes or so that it will take to fill out the attached form. That is how long it took to fill out the form on a trial run. Accuracy is important; the course that you took one summer might be the one that would be important to the study.

I know that you are a very busy person, and I realize that I am asking a lot when I ask you to take time to fill out the questionnaire. However, aside from completing the research problem, I believe that such a study will produce very significant information about the mathematics education in our school system.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,
Rogers T. Martin

APPENDIX A (Continued)

Questionnaire to Teachers of Secondary Mathematics
(Please do not put your name or school on this form)
Do you wish to have a copy of the results of this study? ____ Yes ____ No

Personal Data:
1. Status: Married ____ Single ____
2. Sex: Male ____ Female ____
3. Age: ____

Organization of school
1. High School ____
2. Junior High School ____
3. School enrollment ____

Teaching schedule and other duties:
1. If you teach more than one section of a mathematics course, please list the courses and the number of sections.

Courses	Number of sections
_____	_____
_____	_____
_____	_____
_____	_____

2. Check the other subject areas that you teach.

A. Science _____

B. Social _____

C. Other _____

3. Do you sponsor a club?

	Yes	No
A. Science	___	___
B. Mathematics	___	___
C. Other	___	___

Academic and Professional Status:

1. Degree(s)	Institution(s)	Date Awarded
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

2. Number of years in teaching profession including the present year _____.
3. Number of years teaching mathematics including the present year _____.
4. Academic major in college: _____
   Minor _____
   Graduate Major _____ Minor _____
5. Type of teaching certificate
   Elementary _____
   Secondary _____
   A _____
   B _____
   C _____
   Temporary _____

6. Check mathematics courses pursued in Colleges and Universities (If more or less than three hours, indicate).

	Semester Hours
Undergraduate	
101-102 Fundamental Mathematics	____
105 Intermediate Algebra	____
106 Mathematics of Business	____
111-112 College Algebra and Trigonometry	____
113 Elementary Functions	____
121 Analytic Geometry and Calculus	____
231 Analytic Geometry and Calculus	____
232 Analytic Geometry and Calculus	____
301 Differential Equations	____
303 Elementary Mathematical Statistics	____
311 Fundamental Concepts of Modern Mathematics	____
312 Fundamental Concepts of Modern Mathematics	____
Graduate and Undergraduate	
307 College Geometry	____
401 Differential Equations	____
403 Mathematical Statistics	____
404 Mathematical Statistics	____
405 Applied	____
409 Vector Analysis	____
411 Linear Algebra	____
413 Introduction to Modern Algebra	____
415 Advanced Calculus	____
416 Advanced Calculus	____
419 Topology	____
423 Numerical Analysis	____
424 Numerical Analysis	____
430 Statistical Methods	____
431 Statistical Methods	____
432 Statistical Methods Laboratory	____
433 Statistical Methods Laboratory	____
459 Matrix Theory	____
498 Research	____
Total Undergraduate Hours	____
Graduate Only	
501 Basic Concepts of Elementary Mathematics	____
504 Foundation	____
505 Geometry for Secondary Teachers	____
506-y Selected Mathematics Problems and Related Computer Programs	____
511 Introduction to Analysis	____
512 Introduction to Analysis	____
515 Theory of Function of a Real Variable	____
516 Measure and Integration	____
519 Theory of Functions of a Complex Variable	____
525 Modern Algebra	____
526 Modern Algebra	____
530 General Topology	____
531 Linear Topological Spaces	____
560 General Linear Hypothesis	____
561 General Linear Hypothesis	____
565 Design of Experiments	____
570 Theory of Sampling	____
581 Directed Study	____
599 Thesis	____
Total Graduate Hours	____

7. Methods Courses

	Hours
____Methods of Teaching Mathematics.	____

____Materials and Methods in Arithmetic in Elementary Schools. Hrs. ____

____Materials and Methods in Mathematics in Secondary Schools. Hrs. ____

____Student Teaching in the Lower Elementary Schools. Hrs. ____

____Student Teaching in the Upper Elementary Schools. Hrs. ____

APPENDIX A (Continued)

___Student Teaching in Secondary Schools. Hrs. ___

___Teaching Arithmetic to the Disadvantaged. Hrs. ___

___Teaching Remedial Mathematics. Hrs.___

B. Professional Courses: Number of courses pursued.

___ Foundations of Education

Educational Psychology

A. ___Psychology of Learning

B. ___Growth and Development

C. ___Adolescent Psychology

D. ___Other _____

___Tests and Measurements

___Philosophy of Education

___Principles of Teaching

___General Methods and Classroom Management

___Audio-visual Aids in Education

___Other _____

___Other _____

Membership in Professional Organizations	Yes	No
A. American Mathematical Association	___	___
B. American Mathematical Society	___	___
C. National Council of Teachers of Mathematics	___	___
D. Louisiana Teachers of Mathematics	___	___
E. National Education Association	___	___
F. Caddo Teachers Association	___	___

G. Others_____

_____ _____

Professional Magazines read regularly:

A._____

B._____

C._____

D._____

APPENDIX A (Continued)

2766 Amherst Street
Home Phone 635-8822
Shreveport, Louisiana 71108
January 1973

Dear Fellow Mathematics Teacher:

Sometime ago you received a questionnaire from me about your qualifications as a mathematics teacher. It was put in your mail box by the secretary of your school as it was forwarded through the gray box from the school board office on Midway Street.

I have not received your questionnaire and am enclosing a postcard for you to reply. Please mark one of the following:

( ) I have filled out the questionnaire but have not mailed it although I intend to do so.
( ) I have not filled out the questionnaire but will do so and mail it very soon.
( ) Please send me another questionnaire.
( ) I do not intend to fill out the questionnaire.

The postcard is self-addressed for your convenience.

You are a very important person in this survey and I'm sure that you want to be a part of the study. You can rest assured that your return will be held in the strictest confidence and that no other person will have access to the information you furnish.

I would greatly appreciate it if you would return the postcard immediately. Your decision, whatever it will be, will be respected.

I want to thank you for taking time out of your busy schedule to consider my request.

Sincerely,

Rogers W. Martin

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APPENDIX A (Continued)

2744 Amherst Street
Shreveport, Louisiana
September 9, 1972

Last year I started a research study of the mathematics teachers and the mathematics curricula in Caddo Parish. I sent questionnaires to all the mathematics teachers after securing Mr. Kennedy's permission.

I am still working on the study and need some information on what courses are offered in each school. I am aware that I could get the information from the central office; but, as you may know, forms from the principal's office at each high school would carry more weight than one form from the central office in a matter such as this.

What I need to know, to be specific, is just what is being taught at each grade level in the way of mathematics topics in the classrooms. If you will be so kind as to indicate the title, author, publisher, and copyright date at each grade level on the enclosed form; I will then be able to obtain the topics.

I am enclosing a self-addressed envelope for your use in returning the completed form by the gray box.

I will certainly appreciate the assistance you can give in this matter and I hope it will not inconvenience you.

I have Dr. McKenzie's permission to send a letter to each high school for this information.

Sincerely yours,

Rogers W. Martin

Encl. - 2

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APPENDIX A (Continued)

School _____ Date _____

Principal _____

TEXTBOOKS USED IN CADDO PARISH HIGH SCHOOL MATHEMATICS COURSES IN 1972-1973

Please check the book listed, or provide the correct information if a book was used that was different from the one listed.

NINTH GRADE

Algebra I

___ Book: Modern Algebra Book One, Dolciani, Berman, Freilich, published by Houghton Mifflin Co., Copyright 1962.

___ Book:

___ Book:

(Use extra sheet of paper if necessary)

General Mathematics

___ Book: H E L P GENERAL MATHEMATICS, Phase I, Book I

___ Book: H E L P GENERAL MATHEMATICS, Phase I, Book II

___ Book: H E L P GENERAL MATHEMATICS, Phase II, Book I

___ Book: H E L P GENERAL MATHEMATICS, Phase II, Book II

___ Book:

___ Book:

TENTH GRADE

Geometry

___ Book: Modern Geometry Structure and Method, Jurgensen, Donnelly, and Dolciani, Houghton Mifflin Co., Copyright 1965

___ Book:

___ Book:

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APPENDIX A (Continued)

ELEVENTH GRADE

Second Year Algebra

___ Book: Modern Algebra and Trigonometry, Book 2. Dolciani, Berman, and Wooton. Published by Houghton Mifflin Co., Copyright 1965.

___ Book:

___ Book:

Senior Arithmetic (11th and 12th grades)

___ Book: Life Involves Fostering the Economy, SENIOR ARITHMETIC, Phase I

___ Book: Life Involves Fostering the Economy, SENIOR ARITHMETIC, Phase II

___ Book:

___ Book:

TWELFTH GRADE

Advanced Mathematics

___ Modern Algebra and Trigonometry, Book 2. Dolcizni, Berman and Wooton, Published by Houghton Mifflin Co., Copyright 1965.

___ Book:

___ Book:

OTHER COURSES

Course Title:
Grade Level:

___ Book:

(Use extra sheet of paper if necessary)

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APPENDIX A (Continued)

ELEVENTH GRADE

Second Year Algebra

___ Book: Modern Algebra and Trigonometry, Book 2. Dolciani, Berman, and Wooton. Published by Houghton Mifflin Co., Copyright 1965.

___ Book:

___ Book:

Senior Arithmetic (11th and 12th grades)

___ Book: Life Involves Fostering the Economy, SENIOR ARITHMETIC, Phase I

___ Book: Life Involves Fostering the Economy, SENIOR ARITHMETIC, Phase II

___ Book:

___ Book:

TWELFTH GRADE

Advanced Mathematics

___ Modern Algebra and Trigonometry, Book 2. Dolciani, Berman and Wooton, Published by Houghton Mifflin Co., Copyright 1965.

___ Book:

___ Book:

OTHER COURSES

Course Title:
Grade Level:

___ Book:

(Use extra sheet of paper if necessary)

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APPENDIX A (Continued)

2766 Amherst Street
Shreveport, Louisiana
September 1973

Dear

You were kind enough to complete a questionnaire from me last year in regards to a study of mathematics teachers in Caddo Parish and I appreciated it very much.

I am still working on the study and I need your help again.

In the questionnaire, you stated that you completed the requirements for your Bachelors degree in and the requirements for the M. Ed. in . Your graduate major was in education and your minor was in . I could not determine from the questionnaire whether you had completed further mathematics courses after the date you received your Bachelors degree.

If you have completed additional courses in mathematics at accredited colleges or universities, I would most certainly appreciate it if you would complete the enclosed form and put it in my box. If you have attended summer science and mathematics institutes, that would be most helpful.

I hope this doesn't inconvenience you and I want you to know I certainly appreciate your help.

If I do not hear from you, I will assume that I have the correct record of your mathematics courses.

Sincerely yours,

Rogers W. Martin

APPENDIX A (Continued)

Name _____ Date _____
(last) (first) (middle)

School _____

1. Please list the science and mathematics seminars in order of the dates attended:

Dates From	Dates To	Name of Sponsors (National Science, DuPont, etc.)	Name of college or University

2. Please list the mathematics courses completed and the dates of completion:

Semester Hours Earned	Title of Mathematics Course

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APPENDIX B

APPENDIX B

2765 Amherst Street
Shreveport, Louisiana 71108
January 13, 1973

Mr. Stephen S. Willoughby
23 Press Building
New York University
New York, New York 10003

Dear Mr. Willoughby:

I am working on a research paper, a doctoral dissertation, concerning secondary mathematics teachers.

I sent inquiry letters to all the organizations I thought were vitally interested in mathematics education. The National Council of Teachers of Mathematics was one of the organizations I contacted.

Mr. Carnevale, Director of Professional Services, was so kind as to give me your name as the chairman of the committee developing GUIDELINES FOR THE PREPARATION OF TEACHERS OF MATHEMATICS. He informed me that they were not as yet officially released.

As my paper is in the stages of being completed, I would most certainly appreciate a copy of your Guidelines. I realize that you probably have a date for publication and release; but, I would be most happy if you would send me a copy at that time.

Enclosed is a stamped, self-addressed envelope for your convenience.

Sincerely yours,

Roger M. Martin

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APPENDIX B (Continued)

NEW YORK UNIVERSITY
School of Education
Division of Science and Mathematics Education
23 PRESS BUILDING
WASHINGTON SQUARE, NEW YORK, N.Y. 10003
AREA 212 598-2506

January 23, 1973

Mr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

The NCTM Guidelines have ~~now~~ been approved by the Commission on Preservice Teacher Education, but have not yet been approved by the Board of Directors. The Board will meet in February and presumably will take some action at that time either accepting, rejecting, or proposing some other plan of action.

I had only one copy of the Guidelines and have had a copy made for you which I am enclosing.

I hope this is of some help to you.

Sincerely,

Stephen S. Willoughby
Head, Division of
Science & Mathematics
Education

SSW:MCS

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APPENDIX B (Continued)

PROPOSED GUIDELINES FOR THE PREPARATION OF TEACHERS OF MATHEMATICS

December 20, 1972

Commission on Pre-Service Teacher Education of the NCTM

Introduction

These proposed guidelines were developed by the Commission to help responsible people in colleges and universities that prepare teachers of mathematics find ways in which local teacher preparation programs might be improved. A short form embodying the concepts in these guidelines was compiled for use in accreditation processes (such as NCATE) and is available to anyone from NCTM.

As the name implies, "guidelines" are intended to be just that. They provide for general direction, generally expected levels of competence, possible evidences of the existence of essential characteristics and indications of how the guidelines help realization of goals. In preparing these guidelines, the Commission examined guidelines prepared by CUPM, AAAS, AGTE, and other groups. These guidelines are not meant to contradict or conflict with those prepared by other groups. Rather, they are designed to consolidate and expand on other sets of guidelines for preparation of mathematics teachers.

The guidelines themselves are not meant to be restrictive, and should never be used to justify limiting experimental procedures which might lead to better education of teachers. Rather, the guidelines are indicative of the best available information on the education of teachers and on what appear to be promising practices. Furthermore, the guidelines are not to be used to evaluate individual teachers, and individual guidelines are not generally of equal importance, nor does the order in which they are listed indicate the relative importance of specific guidelines. For example, there may be teachers who are highly successful, but their competencies may be combined in ways that prevent one from establishing a one-to-one correspondence with the competencies set forth in these guidelines. The guidelines should not be used in such cases for determining the quality of a teacher's preparation. These guidelines are designed to help teacher preparation institutions approach the job of preparing teachers to teach mathematics with more flexibility and more emphasis on the quality of the teaching performance of their graduates.

For the most part, these guidelines are stated in terms of specific competencies. There has been no serious attempt, however, to describe precisely how one might go about measuring these competencies. In some cases, that task will be fairly [illegible], assessment of

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APPENDIX B (Continued)

in sufficient quantity should be readily available for use by the prospective teacher. Such resources should include a library with substantial holdings in mathematics, mathematics education, educational foundations, audio-visual equipment (including video-tape machines), mathematics material in a laboratory setting, appropriate classroom space, and cooperative arrangements with a large number and variety of elementary and secondary schools to provide experiences for prospective teachers.

The institution should provide a wide variety of courses in mathematics to meet the needs outlined in Section I. A sufficiently strong program should be available so that the graduate can pursue further mathematical studies. All mathematical courses taught to the prospective elementary or secondary teacher should emphasize understanding, the relation of mathematics to the development of the natural and social sciences and to our culture. These relationships should be easily identifiable with those confronting students the prospective teacher will be teaching.

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APPENDIX B (Continued)

PROPOSED SHORT FORM OF GUIDELINES
FOR THE PREPARATION OF TEACHERS OF MATHEMATICS

December 20, 1972

Commission on Pre-Service Teacher Education of the NCTM

(Note: The complete guidelines are available from the National Council of Teachers of Mathematics)

I. Academic and Professional Knowledge

A prospective teacher of mathematics at any level should know and understand mathematics substantially beyond that which he may be expected to teach. He should be able to relate that mathematics to the world of his pupils, to the natural sciences, and to the social sciences. He should be aware of the role of mathematics in our culture.

The teacher should also possess a knowledge of philosophical, historical, psychological, and sociological aspects of education.

II. Professional Competencies and Attitudes

The teacher should demonstrate positive attitudes towards mathematics, children, and teaching. He should have a realistic concept of his personal characteristics, and be able to instill in others a realistic concept of themselves, through his concern for them. He should demonstrate through extensive work with children, an ability to encourage two-way communication with them concerning mathematics and related areas. The teacher should also demonstrate the abiltity to relate well to children of differing interests and backgrounds. He should recognize individual differences and be able to prescribe appropriate activities to build on these differences.

He should use his academic and professional knowledge to improve his teaching. He should demonstrate the ability and desire to evaluate his own professional competencies. He should grow in his knowledge and teaching competencies as well as in his concern for others.

III. Institutional Responsibilities

All faculty members should have the knowledge, competencies, and attitudes described in sections I and II. They should also have appropriate continuing experiences in schools. Appropriate resources

attainment of the competencies is not presently possible by any objective standards. Indeed, there is some reason to believe that those competencies which are of the greatest importance may be the most difficult to measure objectively. In light of this, individual faculty members and departments will have to make the best subjective measurements they can, but they should make serious efforts to be sure that the evaluations are as appropriate, fair, and objective as possible.

A special comment about three particular points seems appropriate. First, a knowledge of history is of great importance if mankind is to progress. Anybody who is not aware of the mistakes and successes of the past can fully expect to repeat many of the mistakes and relinquish many of the successes.

Second, it is essential for teachers to know more than they are expected to teach and to be able to learn more than they already know. Without such knowledge, progress is essentially impossible unless an entirely new teaching staff is to be employed every few years.

Third, the teacher should have a realistic understanding of himself, his abilities, his values, and his attitudes toward working with children and youth, with other teachers and with school personnel. He should be warm and accepting, but objective in working with others.

The scope of the guidelines is limited to the preparation of classroom teachers. They are not directly applicable to department chairmen, supervisors, elementary specialists, and others. The term "pre-service", as used here, is meant to be interpreted broadly to include all pre-certification professional activities of a prospective teacher, as well as including the first several years of full-time teaching. Indeed, the education and preparation of a teacher should continue throughout his career. Cooperation among schools, colleges, and certification agencies is desirable in preparing teachers up to, and beyond, the time of certification. Some states are using certification procedures that require continued professional preparation for teachers during their entire career.

One further comment about the guidelines may be appropriate. They must be read in context. For example, if item IIB(d), page 11 is viewed by itself, it appears to summarize all of part I. However, taken in the context of the sentences associated with IIB and 1, item (d) describes something that a beginning teacher should learn to evaluate.

To reiterate, these guidelines are not designed to be restrictive. They are offered with the hope that they will encourage competence and compassion in the teaching of mathematics and in the education of teachers of mathematics. If a particular program does not meet all the specifics of these guidelines, but is innovative and encourages competence and compassion, then that program satisfies the essential spirit of these guidelines and will very likely also result in good mathematics education for the students.

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I. Academic and Professional Knowledge

A prospective teacher of mathematics at any level should know and understand mathematics substantially beyond that which he may be expected to teach. He should be able to relate that mathematics to the world of his pupils, to the natural sciences, and to the social sciences. He should be aware of the role of mathematics in our culture.

The teacher should also possess a knowledge of philosophical, historical, psychological, and sociological aspects of education.

A. Mathematical Content

1. Knowledge and competency in mathematics

a. Teachers of early childhood and primary grades (ages 4-8) should be able:

(1) To use and explain base ten numeration system.
(2) To distinguish between rational (meaningful) counting and rote counting.
(3) To perform the four basic operations with whole numbers and with positive rationals with appropriate speed and accuracy.
(4) To explain, at appropriate levels, the mathematical reasons why operations are performed as they are.
(5) To use equality, greater than, and less than relations correctly with their symbols.
(6) To relate the number line to whole numbers and positive rational numbers.
(7) To relate the number line to the concept of linear measure and describe and illustrate basic concepts of measuring such quantities as length, area, weight, volume, time, etc.
(8) To extract concepts of two- and three-dimensional geometry from the real world of the child, and be able to discuss the properties of simple geometric figures such as line, line segment, angle, triangle, quadrilateral, circle, perpendicular and parallel lines, pyramid, cube, sphere, etc., and be able to determine 1-, 2-, and 3-dimensional measures of common figures.
(9) To use a protractor, compass, and straight edge for simple figure drawing, constructing, and measures.
(10) To use the metric system of weights and measures and be able to estimate such measurements in metric units before actually measuring.

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I. A. 1. a.

(11) To create and interpret simple bar, picture, circle, and line graphs on two dimensional coordinate systems and understand the effect of scale changes.
(12) To use a simple calculator to help solve problems.
(13) To use all of the other competencies (1-12) to help create, recognize, and solve problems which are real to adults and children. ("Solving problems" in this context includes ability to recognize problems which have no solution, ability to estimate the expected magnitude of the solution of a problem, and ability to recognize extraneous information in problems.)
(14) To discuss on an elementary level the history, philosophy, nature, and cultural significance of mathematics, both generally and specifically.

b. Teachers of upper elementary and middle school grades (ages 8-12):

(1) Should have all competencies listed in section IAla. Such competencies will be needed for remedial work as well as for understanding of some more advanced topics.
(2) Should be able to name and write large and small numbers and to create physical examples of approximations for such numbers (e.g., one million is approximately the number of minutes in two years; one billion is approximately the number of seconds in 32 years, etc.) and to distinguish between infinity and such numbers as a googolplex.
(3) Should be able to recognize and also produce reasonable, consistent, and logical arguments (proofs) for elementary mathematical statements.
(4) Should be able to perform the four basic operations with positive and negative rational numbers using decimal notation and fractional notation and give a mathematical explanation at appropriate levels as to why the operations are performed as they are.
(5) Should be able to recognize new algorithms or alternative methods for operations and be able to test the effectiveness and correctness of them.
(6) Should be able to solve practical problems in two- and three-dimensional geometry relating to congruence, parallel and perpendicular lines, similarity, symmetry, incidence, areas, volumes, circles, spheres, polygons, polyhedrons, and other geometric figures.
(7) Should be able to use the methods of probability and statistics to solve simple problems pertaining to measures of central tendency and to dispersion, expectation, prediction, and reporting of data.
(8) Should be able to graph polynomial functions and relations and to make appropriate selection and use of such relations in the solution of practical problems.

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APPENDIX B (Continued)

-5-

I. A. 1. b.

(9) Should be able to write flow charts for simple mathematical operations and for other activities.

(10) Should be able to use quantitative skills to help recognize, create, and solve problems similar to those encountered by students at that level.

(11) Should be able to explain the concepts involved in measurement.

c. Teachers of middle and junior high school mathematics (ages 12-14):

(1) Should have all competencies listed in section IA1b. (See item IA1b(1) for explanation.)

(2) Should be able to use appropriate mathematical procedures to solve problems relating to the physical, biological, and social sciences and to relate these processes to junior high school mathematics.

(3) Should be able to explain the differences and similarities between the rational and the real number systems at appropriate levels of sophistication.

(4) Should be able to use the methods of probability and statistics to solve reasonably difficult problems of inference and hypothesis testing.

(5) Should be able to use the methods of linear algebra to solve problems relating to the physical, biological, and social sciences.

(6) Should be able to relate the axioms, definitions, and theorems of abstract algebra to the number systems, algebra, and geometry found in secondary school mathematics curricula.

(7) Should be able to use the methods of number theory and algebra to discover and analyze new, "short-cut," and standard algorithms, and other interesting properties of the systems found in school mathematics.

(8) Should be able to use at least one computer language (e.g., FORTRAN IV, COBOL, BASIC, etc.) to solve problems of appropriate level and complexity with the aid of a modern computer.

(9) Should be able to understand the language and procedures of at least one quantitative science (physics, chemistry, economics, biometrics, etc.) sufficiently well so as to be able to select the appropriate mathematics needed to solve problems in that science in which the level of mathematics required is not above that of elementary calculus.

(10) Should be acquainted with library resources which can be used to whet the mathematical appetites of pupils.

(11) Should be acquainted with the literature available to aid a teacher in organizing a mathematics club, books that are helpful for participants in a mathematics club, and types of activities that may make such a club successful.

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I. A. 1. d. Teachers of senior high school mathematics (ages 14-18):

(1) Should have all competencies listed in section IA1c. (See item IA1b(1) for explanation.)

(2) Should be aware of various outside resources such as MAA lectureships, contests, local industries, journals, etc. that might enrich the mathematical diet of high school students.

(3) Should have sufficient depth in analysis, abstract algebra, linear algebra, geometrics, topology, probability and statistics, logic and foundations of mathematics, and computer science, to be able to:

(a) understand, recognize, and create proofs in some of these branches of mathematics

(b) discuss with some degree of facility the structure of the branch of mathematics with some emphasis on the axiom system studied and the theorems they thought were important, and to relate these to elementary and secondary school mathematics

(c) relate the given branch of mathematics to other aspects of mathematics and the other disciplines

(4) Should have sufficient depth of understanding of at least one quantitative science so as to be able to build mathematical models and to solve problems (with quantitative as well as non-quantitative solutions) in that science which requires mathematics substantially above the level of elementary calculus.

2. Ability and desire to grow in teachers of all levels

a. Teachers of mathematics should be able to recognize the mathematical aspects of situations they have not studied previously. This requires a wide background in other disciplines so as to be able to relate these disciplines to mathematics.

b. Teachers of mathematics should be willing and able to formulate and solve, given a reasonable amount of time and effort, quantitative problems they have not studied previously.

c. Teachers of mathematics should be willing and able to learn mathematics which they have not previously studied with the aid of appropriate books or other materials and through discussion with their peers.

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I. A. 2.

d. Teachers of mathematics should be able to evaluate their knowledge of, and competency in, mathematics in light of curricular requirements of courses they teach and of recommendations of professional groups, and they should be able to determine what further study (formal or informal) they need to increase their competence.

e. Teachers of mathematics should have sufficiently positive attitudes and good academic backgrounds to be able to learn appropriate further mathematics, and to relate the advanced information to increasing their effectiveness as teachers.

f. Teachers of mathematics should have sufficient mathematical aptitude to successfully give leadership to the students they teach and to other teachers.

g. Teachers of mathematics should be able to relate the new mathematics they study and discover to the level of mathematics they are teaching.

B. Humanistic and Behavioral Studies Contributions to Teachers of All Levels

1. Teachers of mathematics should understand human development and the nature of learning mathematics sufficiently well so that they are able:

a. To recognize how existing conditions are related to learning and how models for teaching use and change these existing conditions; to understand such models as concept attainment, inquiry training, laboratory, group investigation, and to recognize under what conditions each is most effective.

b. To select and adapt strategies and materials that are consistent with professional knowledge about learning and are also appropriate for the special immediate situation (as regards the children, the content, the teacher, the environment, etc.).

c. To evaluate conditions, strategies, and materials used to teach mathematics.

d. To recognize stages of cognitive, affective, and psychomotor development in children, and individual differences between children as these pertain to the learning of mathematics.

e. To diagnose and prescribe remedies for common disabilities in the learning of mathematics and know what tools and techniques are available to help with diagnosis and correction.

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APPENDIX B (Continued)

2766 Amherst Street
Shreveport, La. 71103
January 27, 1973

Mr. Stephen S. Willoughby
23 Press Building
New York University
New York, New York 10003

Dear Mr. Willoughby:

Your letter and the copy of the Guidelines arrived today. The Guidelines will be most helpful.

I want to thank you, most heartily, for taking time out of your busy schedule to see that I got the Guidelines. I am indebted to you and your staff.

Enclosed is a check to defray the cost.

Sincerely yours,

Rogers W. Martin

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APPENDIX B (Continued)

NEW YORK UNIVERSITY
School of Education
Division of Science and Mathematics Education
23 PRESS BUILDING
WASHINGTON SQUARE, NEW YORK, N.Y. 10003
AREA 212 598-2436

February 8, 1973

Mr. R. W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

Thank you for the check for $2.00. While it was not necessary, we certainly appreciate your helping to alleviate the cost of duplications.

Since I last wrote to you, the Board of Directors has approved the Guidelines as they were mailed to you and you may, therefore, now refer to those as the official Guidelines of the NCTM.

Sincerely,

Stephen S. Willoughby
Head, Division of
Science & Mathematics
Education

SSW:MCS

APPENDIX C

APPENDIX C

Caddo Parish School Board

Post Office Box 37000
1961 Midway Street
Shreveport, Louisiana 71130
Area Code 318
Telephone 636-6300

May 17, 1973

Mr. R. W. Martin
Woodlawn High School
7340 Wyngate Drive
Shreveport, Louisiana 71106

Dear Mr. Martin:

Listed below are the data that you asked me to send to you concerning math percentiles mean scores for our parish. If I may help you further, do feel free to call me.

12th Grade (12.7) Means Math Percentiles
on Standardized Tests

1972 - N = 3097
Total mean scores fell on 25th Tile

1969 - N = 3186
White students fell on 45th Tile
Black students fell on 5th Tile.

Sincerely yours,

Arminda Riser

(Mrs.) Arminda Riser
Supervisor of Guidance and
Research

AR:ec

APPENDIX C (Continued)

2766 Amherst Street
Shreveport, Louisiana
July 25, 1973

Mrs. Armanda Risor
Supervisor of Research
Caddo Parish School Board
1961 Midway Street
Shreveport, Louisiana

Dear Mrs. Risor:

Thank you very much for calling me and explaining about the mean math scores, etc.

Would you be so kind as to write me a letter and put that explanation in writing so that I can use it to back up my explanation.

Sincerely yours,

Rogers W. Martin

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APPENDIX C (Continued)

Caddo Parish School Board

Post Office Box 32000
and Milam Street

Shreveport, Louisiana 71130

Area Code 318
Telephone 636-2000

July 27, 1973

Mr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

In response to your letter of July 25, 1973, I am enclosing the college record of freshmen who were 1965 graduates of Caddo Parish.

In reply to your question concerning when students are tested with a standardized test, scores are expressed in their relation to the normed group on which the test was standardized.

A means score for a certain group is an average score of that group as it is compared to the average score of the normed group when the certain group took the standardized test. Of course, the standard deviation is a factor that must be considered in looking at the growth pattern of a group of students in which the study is made.

Example: If a test were administered to a group of 10th grade students in October, the group that these students would be compared to would be the standardized group at 10.1, if this group's score were 9.7, then it could be said that this group fell four months below the normed group. The standard deviation would give an insight to how significant these four months were to the growth of the group.

I do hope this information will help you in your findings.

Sincerely yours,

Armintis Riser

(Mrs.) Armintis D. Riser
Supervisor of Guidance and Research

ADR:ec

Enclosure

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APPENDIX C (Continued)

COLLEGE RECORD OF FRESHMEN FROM
CADDO PARISH HIGH SCHOOLS
1965 GRADUATES

RACE	NO. STUDENTS	A	B	C	D	F	TOTAL SUBJECTS
White	1,088	15.1%	30.1%	34.3%	11.9%	8.6%	
		1521	3038	3471	1206	872	10,108
Black	78	23.1%	27.1%	28.3%	11.3%	10.2%	
		98	115	120	48	43	424

APPENDIX C (Continued)

2766 Amherst Street
Shreveport, Louisiana 71108
August 10, 1972

Director
Department of Mathematics
Louisiana State University
Baton Rouge, Louisiana

Dear Sir:

I am working on a research paper on secondary mathematics teachers.

It would be greatly appreciated if you would send me the qualifications of an ideal teacher of mathematics at the secondary level...if you have one that has been formulated. Naturally, I am going to several sources and I hope to put all of my findings together.

Thanking you in advance, I remain,

Sincerely,

Rogers W. Martin

Sorry, we have no such statement: It is a big order.

James E. Keisler
Assoc. Chm.
Dept. of Mathematics

APPENDIX C (Continued)

2766 Arboret Street
Shreveport, Louisiana
December 4, 1972

Mr. Owen B. Kiernan
Executive Secretary
National Association of Secondary-School Principals
1201 16th Street, N.W.
Washington, D.C. 20036

Dear Mr. Kiernan:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where these latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers V. Martin
Doctoral Fellow

APPENDIX C (Continued)

NATIONAL ASSOCIATION OF SECONDARY SCHOOL PRINCIPALS
1201 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036

December 13, 1972

Mr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana
71108

Dear Mr. Martin:

As much as we would like to help in your efforts toward your Ph.D., we regret that NASSP does not have any set guidelines or recommendations for the ideal secondary school mathematics teacher. There is, however, an organization which should be able to furnish you with the needed information. The National Council of Teachers of Mathematics is located here at 1201 Sixteenth Street, Washington, D.C. 20036. Mr. James D. Gates is the Executive Secretary and should be able to assist you.

Sincerely,

Steve Tegarden

R. Stephen Tegarden
Assistant to the Executive Secretary

RST:cap

APPENDIX C (Continued)

2765 Amherst Street
Shreveport, Louisiana
December 4, 1972

Mr. Leland J. Haworth, Director
National Science Foundation
1800 G. Street, N.W.
Washington, D.C. 20550

Dear Mr. Haworth:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where these latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers W. Martin
Doctoral Fellow

APPENDIX C (Continued)

NA[T]ONAL SCIENCE FOUNDATIO[N]

WASHINGTON, D.C. 20550

December 12, 1972

Dr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Dr. Martin:

Your letter of December 4, requesting recommendations for the education of mathematics teachers has been forwarded to me for action.

For your information, I am enclosing the publication: Recommendations on Course Content for the Training of Teachers of Mathematics, prepared by the Committee on the Undergraduate Program in Mathematics (CUPM). Please be advised that these recommendations are not officially endorsed by the National Science Foundation. As a federal funding agency, the Foundation supports many projects financially, but does not necessarily endorse the results of the projects.

I hope this is helpful to you and I appreciate your interest in the education programs of the National Science Foundation. Best wishes on your future endeavors.

Sincerely yours,

Alphonse Buccino

Alphonse Buccino
Associate Program Director
Academic Year Study Program

APPENDIX D

APPENDIX D

2716 Antoret Street
Shreveport, Louisiana
December 4, 1972

The Journal of Teacher Education
1201 Sixteenth Street
Washington, D.C. 20036

Dear Sir:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where these latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers W. Martin
Doctoral Fellow

APPENDIX B (Continued)

2766 Amherst Street
Shreveport, Louisiana
December 4, 1972

Mr. Truman A. Botts
Executive Director
Conference Board of the Mathematical Sciences
834 Joseph Henry Building
2100 Pennsylvania Avenue, N.W.
Washington, D.C. 20037

Dear Mr. Botts:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where those latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers T. Martin
Doctoral Fellow

APPENDIX D (Continued)

(Written in red ink on the bottom and top of letter)

6 December 1972

Dear Mr. Martin:

CBMS has no officially-approved recommendations on the qualifications of secondary mathematics teachers. However, enclose a borchure from the National Council of Teachers of Mathematics, which is our member organization most directly concerned. It is possible that they have further information for which you might apply.

Sincerely yours,

/s/ Truman Botts

P.S. You should request, if you don't already have it, the Recommendations on Course Content for the Training of Teachers of Mathematics (1971), issued by the Committee on the Undergraduate Program in Mathematics, P.O. Box 1024, Berkeley, California 94701.

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APPENDIX D (Continued)

2766 Amherst Street
Shreveport, Louisiana
December 4, 1972

Mr. George Pedrick
Executive Director
Committee on The Undergraduate Program
in Mathematics
P. O. Box 1024
Berkeley, California 94701

Dear Mr. Pedrick:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where these latest recommendations could be located in national publication. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers W. Martin
Doctoral Fellow

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COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS

PAUL J. KNOPP
Executive Director
WILLIAM L. MATTOCCIA
Director
KATHLEEN S. McCARTHY
Administrative Assistant

CUPM CENTRAL OFFICE
Post Office Box 1024
Berkeley, California 94701
(415) 527-2345

December 11, 1972

Mr. Roger W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

Your letter was forwarded to me by Dr. Gordon Walker. We are sending you one copy of each of our reports. These include our latest recommendations on course content for training secondary mathematics teachers.

Perhaps you would also be interested in consulting the following doctoral dissertations in 1970 from Northwestern University:

Clarence J. Duckweiler: A Study of the Impact of a CUPM Inspired Mathematics Course on the Level of Mathematical Understanding of Luthern Elementary School Teachers.

Thomas Herbert McGannon: A Comparison of Two Methods of Teaching Calculus with Special Inquiry into Creativity.

You might also want to consult Investigations in Mathematics Education, a publication of

The Center for Science and Mathematics Education
1945 North High Street
Columbus, Ohio 43210

We hope our reports will assist you in your research.

Sincerely,

Paul J. Knopp

Paul J. Knopp

PJK/kes

APPENDIX B (Continued)

2766 Interst Street
Shreveport, Louisiana
December 4, 1972

Mr. Dael Wolfe
Executive Officer
American Association for the Advancement of Science
1515 Massachusetts Avenue, N.W.
Washington, D.C. 20005

Dear Mr. Wolfe:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where these latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers W. Martin
Doctoral Fellow

APPENDIX D (Continued)

American Association
for the Advancement of Science

1515 MASSACHUSETTS AVENUE, NW, WASHINGTON, D. C., 20005

Phone: 467-4400 (Area Code 202) Cable Address: Advancesci, Washington, D.C.

8 December 1972

Mr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

This is in response to your letter of 4 December, requesting information on standards for teachers of mathematics. The American Association for the Advancement of Science does not establish or have any "officially approved" standards for those teaching any of the disciplinary subjects.

I am sure that you have included the mathematics societies and those related to the teaching of science in your coverage. It is more likely that they can be helpful in meeting your needs.

Sincerely,

R. Trumbull

Richard Trumbull
Deputy Executive Officer

RT:lp

APPENDIX D (Continued)

2766 Albert Street
Shreveport, Louisiana
December 4, 1972

Mr. Alfred D. Willcox
Executive Director
Mathematical Association of America
1225 Connecticut Avenue, N.W.
Washington, D.C. 20036

Dear Mr. Willcox:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and organizations.

Recently, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not available, you could let me know where these latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers T. Martin
Doctoral Fellow

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APPENDIX D (Continued)

2766 Amherst Street
Shreveport, Louisiana
December 4, 1972

Mr. Gordon L. Walker
Executive Secretary
American Mathematical Society
P. O. Box 6248
Providence, Rhode Island 02904

Dear Mr. Walker:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers. These qualifications are to be compared to the recommendations of the ideal secondary mathematics teacher by current standards of outstanding authorities and associations.

Naturally, I have secured several sets of recommendations from a review of the related literature; however, I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization. If there is a nominal fee, please bill me and I will be glad to forward the charge. If this is not expedient, you could let me know where these latest recommendations could be located in national publications. In either case, it would be greatly appreciated.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers W. Martin
Doctoral Fellow

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APPENDIX D (Continued)

AMERICAN MATHEMATICAL SOCIETY
201 SOUTH MAIN STREET
P. O. BOX 6248, PROVIDENCE, R. I. 02904
TEL. 272-9500 AREA 401

GORDON L. WALKER
Executive Director

Please reply to: ED/1
December 7, 1972

Mr. Roger W. Martin
2766 Amherst Street
Shreveport, Louisiana 71103

Dear Mr. Martin:

Thank you for your letter of December 4. I think that the information you have requested on the qualifications of a group of secondary mathematics teachers can better be supplied by the Committee on the Undergraduate Program in Mathematics, P. O. Box 1024, Berkeley, California 94701. I am referring your December 4 letter to the executive director of CUPM, Dr. Andrew Sterrett.

Sincerely yours,

Gordon L. Walker

GLW:bws
cc: Dr. A. Sterrett

APPENDIX D (Continued)

2765 Amherst Street
Shreveport, La. 71108
December 21, 1972

National Association of Independent Schools
Four Liberty Square
Boston, Massachusetts 02109

Dear Sir:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers.

I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it very much if you would provide me with an up-to-date set of recommendations officially approved by your organization.

Enclosed is a self-addressed, stamped envelope for your convenience.

Sincerely yours,

Rogers W. Martin
Doctoral Fellow

Approved

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APPENDIX D (Continued)

NATIONAL ASSOCIATION OF INDEPENDENT SCHOOLS

Four Liberty Square
Boston, Massachusetts 02109
617 542-1988

January 3, 1973

Mr. Rogers W. Martin
Doctoral Fellow
2766 Amherst Street
Shreveport, LA 71108

Dear Mr. Martin:

The National Association of Independent Schools is a voluntary membership organization of independent schools. As a service organization, we do offer some workshops for teachers and other such in-service training activities, but we do not set qualifications for teachers or make recommendations for the specific training of them. Personnel in each school will determine whether or not they feel a candidate for employment is qualified to meet their needs and standards. These requirements will vary from school to school and from one part of the country to another.

Thus, if you are interested in surveying the qualifications set by independent schools, I presume the best way to do it would be to take a random sampling of a number of private schools. As you probably know, one of the most complete listings of schools is to be found in Porter Sargent's "The Handbook of Private Schools," a book to be found in most libraries. From that listing you could make a good sampling.

Also I am enclosing with this letter the names and addresses of the members of our Mathematics Committee. As I stated above, as an NAIS Committee, they do not set standards for mathematics teachers, but they are able, experienced teachers themselves and they may have some suggestions for you if you care to get in touch with them.

Sorry not to be more helpful, but wish you success in your research.

Sincerely,

Wellington V. Grimes

Wellington V. Grimes
DIRECTOR OF ACADEMIC
SERVICES

WVG/jmw
enc.

APPENDIX D (Continued)

NAIS MATHEMATICS COMMITTEE PERSONNEL

Charles E. Leake: Chairman
Lake Forest Ctry Dey School
145 South Green Bay Road
Lake Forest, Ill. 60045

Mrs. William Doolittle
Interlaken Road
Lakeville, CT 06039

Clarence W. Leeds, III
Simon's Rock
Alford Road
Great Barrington, MA 01230

Mrs. Dia Maly
Emma Willard School
285 Pawling Avenue
Troy, N Y 12181

Mrs. Yazan Sharif
Shady Hill School
178 Coolidge Hill
Cambridge, MA 02138

Miss Adeline Scovil
Emma Willard School
285 Pawling Avenue
Troy, N Y 12181

Frederick F. Trask, III
Greenwich Ctry Day School
330 Old Church Road
Greenwich, CT 06830

Gordon H. Clem, Consultant
Choir School of St. Thomas Church
123 West 55th Street
New York, N Y 10019

APPENDIX E

APPENDIX E

2766 Acherst Street
Shreveport, Louisiana 71108
December 22, 1973

Mr. Joseph Z. Carravella
Director of Professional Services
The National Council of Teachers of Mathematics
1201 16th Street, NW
Washington, D. C. 20036

Dear Mr. Caravella:

Thank you very much for your two letters. They have been most helpful. I have sent out a good many letters in addition to an exhaustive research of the literature.

Of the six sources you mentioned, I have already contacted four of them and will forward a letter of inquiry to the other two. I am trying not to overlook any possible source.

Again, thank you very much, and Seasons greeting to you and your staff.

Sincerely yours,

Eugene W. Martin

APPENDIX I (Continued)

The National Council of
Teachers of Mathematics
1201 16th Street, NW, Washington, D.C. 20036 / (202) 833-4425

18 December 1972

Mr. Rogers W. Martin
Doctoral Fellow
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

We are replying both to your letter requesting research information from this organization, as well as to a similar letter originally directed to the National Education Association, and forwarded to us for reply.

The best continuing sources of information on all facets of mathematics education are the NCTM's official journals, the ARITHMETIC TEACHER and the MATHEMATICS TEACHER. The articles and associated bibliographies contained in these professional magazines will lead you to nearly all the literature available on your particular area of interest. A helpful CUMULATIVE INDEX which catalogs 58 volumes of the MATHEMATICS TEACHER is available; indexes to the year's articles can be found in the December issue of each journal.

Recommendations regarding the training of teachers of mathematics and the sources from which they can be obtained are listed below:

1. Committee on the Undergraduate Program in Mathematics
   P.O. Box 1024
   Berkeley, California 94701

   "Recommendations on Course Content for the Training of Teachers of Mathematics"

   "Forty-One Conferences on the Training of Teachers of Elementary School Mathematics"

2. American Association for the Advancement of Science
   1515 Massachusetts Avenue, NW
   Washington, D.C. 20005

   "Guidelines for Science and Mathematics in the Preparation Program of Elementary School Teachers"

   "Guidelines and Standards for the Education of Secondary School Teachers of Science and Mathematics"

   "Preservice Science Education of Elementary School Teachers"

APPENDIX E (Continued)

3. National Association of Independent Schools Four Liberty Square Boston, Massachusetts 02109	"Preparation of Teachers for Secondary Schools" "The Nurture of a First-Class Faculty"
4. American Association of Colleges for Teacher Education 1 Dupont Circle Washington, D.C. 20036	"Reader's Guide to Programs for Preparing Elementary Teachers"
5. Dr. Kenneth J. Travers College of Education University of Illinois Urbana, Illinois 61801	"Conference Report of Teacher Education"
6. Mr. Dale La Frenz, President Minnesota Council of Teachers of Mathematics 3413 Skycroft Circle Minneapolis, Minnesota 55418	"Patterns for Professional Progress"

Enclosed is National Council of Teachers of Mathematics Current Publications list. You may find that some of the items listed are relevant to your area of interest. Also enclosed is a listing of SOURCES OF RESEARCH INFORMATION FOR MATHEMATICS EDUCATION, to which you can direct further study.

If you have not already done so, we strongly recommend your contacting the U.S. Office of Education's Educational Research Information Clearinghouse (ERIC), which is located at the USOE, 400 Maryland Avenue, SW, Washington, D.C. 20202. An ERIC branch is also maintained exclusively for science, mathematics, and environmental education. You may contact: SMEAC/Science, Mathematics, and Environmental Education Information Analysis Center, 1460 West Lane Avenue, Columbus, Ohio 43210.

We hope this information will be useful, and invite you to contact us whenever there is a possibility that we can be of assistance.

Sincerely,

Joseph R. Caravella

Joseph R. Caravella
Director of Professional Services

JRC:eve

Enclosures

APPENDIX E (Continued)

2766 Amherst Street
Shreveport, Louisiana 71108
December 22, 1972

Dr. Kenneth J. Travers
College of Education
University of Illinois
Urbana, Illinois 61801

Dear Dr. Travers:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers.

I am desirous of obtaining the very latest recommendations of three organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it if you would provide me with an up-to-date set of recommendations officially approved by your organization.

Included is a self-addressed, stamped, envelope for your convenience.

Sincerely,

Eugene W. Martin

APPENDIX E (Continued)

2716 Lakeview Drive
Shreveport, Louisiana 71108
December 22, 1972

Mr. Dale La Force, President
Minnesota Council of Teachers
of Mathematics
2410 Skycrest Circle
Minneapolis, Minnesota 55418

Dear Mr. Force:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers.

I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it very much if you would provide me with an up-to-date set of recommendations officially approved by your organization.

Enclosed is a self-addressed, stamped, envelope for your convenience.

Sincerely,

Roger T. Kurtis

BEST COPY AVAILABLE

APPENDIX I (Continued)

MINNESOTA COUNCIL OF TEACHERS OF MATHEMATICS
P.O. Box 12502 New Brighton, Minnesota 55112

President
Dale LaFrenz

Executive Secretary
Donald C. Holmagel

January 5, 1973

Mr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

The enclosed document, "Patterns for Professional Growth", by the Minnesota Council of Teachers of Mathematics may be of some help to you. Our organization does not have a document that specifically addresses the question of qualifications for secondary school mathematics teachers.

Best wishes for success on your dissertation.

Sincerely,

Dale LaFrenz

Dale LaFrenz
President

DL/ee
Enc.

APPENDIX I (Continued)

2711 Auburn Street
Shreveport, Louisiana 71108
December 23, 1972

American Association of Colleges
for Teacher Education
1 Dupont Circle
Washington, D. C. 20036

Dear Sir:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers.

I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would certainly appreciate it very much if you would provide me with an up-to-date set of recommendations officially approved by your organization.

Enclosed is a self-addressed, stamped, envelope for your convenience.

Sincerely,

Rogers L. Martin

APPENDIX E (Continued)

AMERICAN ASSOCIATION OF COLLEGES FOR TEACHER EDUCATION
One Dupont Circle, Washington, D.C. [illegible]

January 16, 1973

Mr. Rogers W. Martin
2766 Amherst Street
Shreveport, Louisiana 71108

Dear Mr. Martin:

Your letter of December 23 requesting information about the qualifications of secondary mathematics teachers has been transferred to the ERIC Clearinghouse on Teacher Education.

Miss Mary Jane Minkel, Information Analyst, will be sending you some suggestions for finding information that will help you with your dissertation.

With specific reference to your need for "official" recommendations for secondary math teachers, it may be most useful for you to determine the various states' certification requirements for mathematics teachers. State certification requirements are very likely the most direct indication of requirements for the preparation and qualification of secondary mathematics teachers that you will be able to find.

Please do not hesitate to contact us again if we can be of further assistance to you. Best wishes with your doctoral work.

Sincerely yours,

[signature]
Jonas Silberman
Special Projects Director

JS:ml
cc: Miss Mary Jane Minkel

APPENDIX F

276 Amherst Street
Shreveport, La. 71108
December 23, 1972

U. S. Office of Education's
Educational Research Information Clearinghouse (ERIC)
400 Maryland Avenue, SW
Washington, D. C. 20202

Dear Sir:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers.

I am in search of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would appreciate it very much if you could furnish me with any information as to the different organizations which have in the very recent past officially approved recommendations for the education of secondary mathematics teachers.

Sincerely,

Eugene F. Vaccia

APPENDIX I

ENCARTA FOR U.S. OFFICE OF EDUCATION BY LEASCO SYSTEMS & RESEARCH CORPORATION

In reply to your inquiry about education research reports:

The Educational Resources Information Center (ERIC) of the Office of Education publishes a monthly abstract journal, Research in Education, which announces recently completed research or research-related reports of interest to the educational community. Reports are abstracted and indexed by subject, author or investigator, and responsible institution.

Research in Education started publication in November 1966 and can be purchased in single copies or on subscription from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Individual monthly volumes and yearly cumulations of Research in Education are available in many college and university libraries as well as some special libraries. Most of these libraries are open to the public for on-site reference. Also, the volumes are available in the offices of many school systems at the state and local level.

Reports referenced in Research in Education (except for some copyrighted material) can be purchased in microfiche or hard copy from the ERIC Document Reproduction Service (EDRS), Leasco Information Products, Inc., 4827 Rugby Avenue, Bethesda, Maryland 20014. All orders should cite the Document Accession Number (ED#).

Enclosed is literature which explains the operation of ERIC in detail and lists the ERIC Clearinghouses and their primary areas of subject coverage. All of the Clearinghouses' major products (i.e., bibliographies, reviews, substantive articles, monographs, etc.) will be announced in Research in Education. The Clearinghouses have limited resources for reference and bibliographic services on specific subject areas. Therefore, all routine searches for documentary material, no matter what the subject, should begin with Research in Education.

Sincerely yours,

Dorothy A. Slanky

(Mrs.) Dorothy A. Slanky
Reference Librarian
ERIC Processing and
Reference Facility

Enclosures

4833 RUGBY AVENUE, BETHESDA, MARYLAND 20014 • (301) 656-9723

APPENDIX F (Continued)

2766 Amherst Street
Shreveport, La., 71108
January 6, 1973

SMEAC/ Science, Mathematics, and Environmental Education
Information Analysis Center
1460 West Lane Avenue
Columbus, Ohio 43210

Dear Sir:

I am working on a research paper, doctoral dissertation, on the qualifications of a group of secondary mathematics teachers.

I am desirous of obtaining the very latest recommendations of those organizations which are most vitally interested in mathematics education.

Therefore, I would appreciate it very much if you could furnish me with any information as to the different organizations which have in the very recent past officially approved recommendations for the education of secondary mathematics teachers.

Sincerely yours,

Rogers T. Martin

P.S. Enclosed is a stamped, self-addressed envelope for your convenience.

APPENDIX F (Continued)

2766 Amherst Street
Shreveport, La. 71108
Dec. 5, 1973

Ohio State University
Center for Science and Mathematics Education
248 Arps Hall
Columbus, Ohio 43210

Dear Sir:

I am working on a dissertation on the qualifications of secondary mathematics teachers.

In reviewing the ERIC index, I note that your organization has a bulletin entitled: "Pre-Inting Practices in Mathematics Teacher Education (Compiled for the Forum on Teacher Education, National Council of Teachers of Mathematics Annual Convention, Chicago, Ill., April 1972.)

The cost was given as $3.00 plus $.25 handling.

Please forward to the addres above as soon as possible.

Sincerely yours,

Roger N. Estes

P.S. Enclosed is a check for $3.25.

APPENDIX F (Continued)

2765 Amherst Street
Shreveport, Louisiana 71108
January 17, 1973

JAN 23 1973

Dr. R. C. Berle
School of Education
Stanford University
Stanford, California

Dear Dr. Begle:

I am working on a research problem, a doctoral dissertation, concerning the qualifications of a group of secondary mathematics teachers.

It is my desire to obtain from organizations vitally interested in mathematics education the official recommendations for the training of secondary mathematics teachers.

I would certainly appreciate it if you would give me a set of the recommendations officially approved by the SMSG, or inform me where I might obtain such a copy.

Thanking you in advance, I remain,

Sincerely yours,

Rogers W. Martin

P.S. Enclosed is a stamped, self-addressed envelope.

SMSG made no recommendations on teacher training.

T.L.G.

APPENDIX F (Continued)

2766 Amherst Street
Shreveport, La. 71108
January 22, 1973

Mr. Donald J. Bolduc
Departmental Editor of School Science and Mathematics
Northern Michigan University
Marquette, Michigan 49855

Dear Sir:

I am working on a research project, a doctoral dissertation, on the publications of a group of secondary mathematics teachers.

I am desirous of obtaining the recommendations of organizations vitally interested in mathematics education. In my study of related literature I have been directed to the School Science and Mathematics Journal on two occasions: "Promising Practices in Mathematics Teacher Education, June 1956, 435-44 and also the same title in January 1962, 25-40.

Is there an index published at regular intervals that one may use to scan for similar articles?

If there is not such an index, would you be so kind as to inform me who in the organization's staff might be able to furnish me with the information?

Enclosed is a self-addressed, stamped, envelope for your convenience.

Sincerely,

Rogers T. Martin
Doctoral Fellow

APPENDIX F (Continued)

School Science and Mathematics Association, Incorporated

Executive Office
P. O. Box 246
Bloomington, Indiana 47401

Editorial Office:
535 Kendall Avenue
Kalamazoo, Michigan 49007

Mr. Rogers W. Martin
2766 Amherst
Shreveport, Louisiana 71108

Dear Mr. Martin:

Your letter of January 22, 1973, to Mr. Donald D. Heikken, Departmental Editor of School Science and Mathematics, a copy of which is enclosed for your reference, was turned over to me for reply. The center pages of the December issue of the Journal contain the annual index for the year. This should help you with the information you are seeking.

A cumulative index covering the first 60 years of the Journal was published in 1961 and may be purchased by writing the Executive Secretary at the following address:

Dr. Dale M. Shafer
Executive Secretary, SSMA
Lewis House
P.O. Box 1654
Indiana University of Pennsylvania
Indiana, Pennsylvania 15701

I hope sincerely that I have been able to supply you with the information you have been seeking.

Sincerely,

George J. Mallinson, Editor

GJM:cg

Enclosure

APPENDIX C

September 26, 1973

APPENDIX C

TO: All teachers of phased subjects

FROM: J. H. Cook, Jr., Principal

SUBJECT: Re-phasing

The purpose of phasing in the Caddo Parish Schools is to group students on the basis of achievement. Appropriate materials and teaching methods are then used to provide maximum opportunity for success in the classroom for each student.

Each year some students are found to be misphased, while others are overlooked. It is our duty to try to place each child in the best possible situation for learning.

I would like to urge each of you, as a matter of routine, to check the cumulative record of each student for evidence of proper or improper phase placement. Only through such an effort will we be able to correctly phase all students.

Should you discover some that have been misphased, please fill out the attached form and send it to your coordinator as soon as possible - but no later than _____. If you need help in reading or interpreting test score information in the records, please feel free to call on your coordinator or a counselor.

Please check the information below to correctly fill out the "Recommendation for Phase Change" Form:

1. Fill in all information requested.
2. Use student's name as it appears on your computer roll.
3. Class: Student classification: Freshman, Sophomore, Junior, Senior
4. Period - place in left margin beside student's name.
5. Current Grades: Average to date in your class.
6. Classroom Summary: Brief summary of student's classroom work.
7. TIQ: Total Intelligent Quotient - note: You will find 3 IQ values in the records...LIQ (Language), NLIQ (Non-language), and TIQ (Total). Please use total IQ from the latest test results.
8. R.V.: Reading Vocabulary (National percentile).
9. R.C.: Reading Comprehension (National percentile). This score is used in initial phase placement.
   Phase 1 = 0-20 percentile Phase 3 = 41-75 percentile
   Phase 2 = 21-40 percentile Phase 4 = 76-99 percentile
10. M.F.: Math Fundamentals or Arithmetic Fundamentals or Computation (depends on test).
11. M.P.: Math or Arithmetic Reasoning or Concepts and Problems (depends on test given).
12. E.L.: English Level (Jr. High & Elementary): Highest level attain... (see "Reading Record Card" CPS-SA-22).
13. M.L.: Math Level (Jr. High & Elementary): Highest level attained (see "Math Record Card" CPS-SA-21).
14. Blank: Other pertinent information.
15. Fill one form for each subject.
16. PLEASE OBTAIN INFORMATION FROM MOST RECENT STANDARDIZED TEST.

APPENDIX H

APPENDIX H

TABLE 18

TOPICS IN MATHEMATICS TAUGHT COLLEGE-BOUND STUDENTS
IN THE NINTH GRADE IN CADDO PARISH, LOUISIANA

Ninth Grade (1)	Schools in Caddo Parish (2)													
	Bethune High School	Broadmoor Jr. High School	Byrd High School	Captain Shreve High School	Fair Park High School	Lakeshore Jr. High School	Linwood Jr. High School	Midway Jr. High School	North Caddo High School	Northwood High School	Oak Terrace Jr. High School	Southwood High School	Valencia Jr. High School	Woodlawn High School
First Year Algebra Topics:														
Symbols and Sets	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Variables and Open Sentences	x	x	x	x	x	x	x	x	x	x	x	x	x	
Axioms, Equations & Problem Solving	x	x	x	x	x	x	x	x	x	x	x	x	x	
The Negative Numbers	x	x	x	x	x	x	x	x	x	x	x	x	x	
Equations, Inequalities & Problem Solving	x	x	x	x	x	x	x	x	x	x	x	x	x	
Working with Polynomials	x	x	x	x	x	x	x	x	x	x	x	x	x	
Special Products and Factoring	x	x	x	x	x	x	x	x	x	x	x	x	x	

APPENDIX H (Continued)

TABLE 18--Continued

Ninth Grade	(1)	(2) Schools in Caddo Parish													
		Bethune High School	Broadmoor Jr. High School	Byrd High School	Captain Shreve High School	Fair Park High School	Lakeshore Jr. High School	Linwood Jr. High School	Midway Jr. High School	North Caddo High School	Northwood High School	Oak Terrace Jr. High School	Southwood High School	Valencia Jr. High School	Woodlawn High School
Working with Fractions	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Graphs	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sentences in Two Variables	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
The Real Numbers	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Function and Variation	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Geometry and Trigonometry	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Sources: Column 1: Dolciani, Mary P., Simon L. Berman, and Julius Freilich, Book I Modern Algebra (Boston: Houghton Mifflin Co., 1962), pp. v-x.

Column 2: Based on questionnaire survey of Caddo Parish principals conducted in Fall of 1973.

TABLE 19

TOPICS IN MATHEMATICS TAUGHT CAREER STUDENTS IN THE NINTH GRADE IN CADDO PARISH, LOUISIANA

(1) Ninth Grade General Mathematics Phase I*	(2) Schools in Caddo Parish													
	Bethune High School	Broadmoor Jr. High School	Byrd High School	Captain Shreve High School	Fair Park High School	Lakeshore Jr. High School	Linwood Jr. High School	Midway Jr. High School	North Caddo High School	Northwood High School	Oak Terrace Jr. High School	Southwood High School	Valencia Jr. High School	Woodlawn High School
Outline of Behavioral Objectives:														
Non-Mathematical Flowcharting	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Integers														
Place Value	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Common Fractional Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations with Fractional Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations with Integers, Fractional Numerals and Mixed Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Decimal Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Place Value	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations with Decimal Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x

TABLE 19--Continued

(1) Ninth Grade General Mathematics Phase I*	(2) Schools in Caddo Parish													
	Bethune High School	Broadmoor Jr. High School	Byrd High School	Captain Shreve High School	Fair Park High School	Lakeshore Jr. High School	Linwood Jr. High School	Midway Jr. High School	North Caddo High School	Northwood High School	Oak Terrace Jr. High School	Southwood High School	Valencia Jr. High School	Woodlawn High School
Ratio and Percent														
Ratio	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Percent	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Measurement														
Time	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Weight	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Liquid	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Length	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Geometry														
Basic Figures of Geometry	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Circle	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Polygons	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Construction	x	x	x	x	x	x	x	x	x	x	x	x	x	x

* See Appendix G for criteria used in assigning students to phase schedules.

Source: Column 1: Caddo Parish Public Schools, Help Every Low-Achiever Progress (Shreveport, Caddo Parish Public Schools, 1972), p. iii.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

TABLE 20

TOPICS IN MATHEMATICS TAUGHT CAREER STUDENTS IN THE NINTH GRADE IN CADDO PARISH, LOUISIANA

(1)	(2) Schools in Caddo Parish													
Ninth Grade General Mathematics Phase II*	Bethune High School	Broadmoor Jr. High School	Byrd High School	Captain Shreve High School	Fair Park High School	Lakeshore Jr. High School	Linwood Jr. High School	Midway Jr. High School	North Caddo High School	Northwood High School	Oak Terrace Jr. High School	Southwood High School	Valencia Jr. High School	Woodlawn High School
Non-mathematical Flowcharting														
Integers														
Place Value	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations with Integers	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Common Fractional Numerals														
Definitions	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Equivalent Fractional Numerals														
Mixed Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations with Integers, Fractional Numerals and Mixed Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x

APPENDIX H (Continued)

TABLE 20--Continued

(1) Ninth Grade General Mathematics Phase II*	(2) Schools in Caddo Parish														
	Bethune High School	Broadmoor Jr. High School	Byrd High School	Captain Shreve High School	Fair Park High School	Lakeshore Jr. High School	Linwood Jr. High School	Midway Jr. High School	North Caddo High School	Northwood High School	Oak Terrace Jr. High School	Southwood High School	Valencia Jr. high School	Woodlawn High School	
Computes, using															
Integers, Fractional Numerals and Mixed Numerals to Solve Problems which are Prevalent to Daily Living	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Decimal Numerals															
Place Value	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operations with Decimal Numerals	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Ratio, Proportion, and Percent															
Ratio and Proportion	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Measurement															
Time	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Weight and Liquid Measure	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Length	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

APPENDIX H (Continued)

TABLE 20--Continued

| (1) Ninth Grade General Mathematics Phase II* | (2) Schools in Caddo Parish | | |

APPENDIX H (Continued)

TABLE 20--Continued

(1)	(2) Schools in Caddo Parish
Ninth Grade General Mathematics Phase II*	Bethune High School
	Broadmoor Jr. High School
	Byrd High School
	Captain Shreve High School
	Fair Park High School
	Lakeshore Jr. High School
	Linwood Jr. High School
	Midway Jr. High School
	North Caddo High School
	Northwood High School
	Oak Terrace Jr. High School
	Southwood High School
	Valencia Jr. High School
	Woodlawn High School

* See Appendix G for criteria used in assigning students to phase schedules.

Sources: Column 1: Caddo Parish Public Schools, Help Every Low-Achiever Progress (Shreveport, Caddo Parish Public Schools, 1972), p. 111.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

TABLE 21

TOPICS IN MATHEMATICS TAUGHT COLLEGE-BOUND STUDENTS
IN THE TENTH GRADE IN CADDO PARISH, LOUISIANA

(1)	(2) Schools in Caddo Parish						
Tenth Grade Elements of Geometry	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Topics:							
Induction, A Method of Discovery	x	x	x	x	x	x	x
Deduction and Proof	x	x	x	x	x	x	x
Angle Relationships: Perpendicular Lines	x	x	x	x	x	x	x
Parallel Lines and Planes	x	x	x	x	x	x	x
Congruent Triangles	x	x	x	x	x	x	x
Similar Polygons	x	x	x	x	x	x	x
Trigonometry	x	x	x	x	x	x	x
Circles, Areas, and Angles	x	x	x	x	x	x	x
Constructions and Loci	x	x	x	x	x	x	x
Coordinate Geometry--Methods	x	x	x	x	x	x	x
Coordinate Geometry--Proofs	x	x	x	x	x	x	x

TABLE 21--Continued

(1)	(2) Schools in Caddo Parish						
Tenth Grade Elements of Geometry	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Areas of Polygons and Circles	x	x	x	x	x	x	x
Areas and Volumes of Solids	x	x	x	x	x	x	x

Sources: Column 1: Jurgensen, Ray C., Alfred J. Donnelly, and Mary P. Dolciani, Modern Geometry (Boston: Houghton Mifflin Co., 1965), pp. vii-xi.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

APPENDIX H (Continued)

TABLE 22

TOPICS IN MATHEMATICS TAUGHT CAREER STUDENTS IN THE ELEVENTH GRADE IN CADDO PARISH, LOUISIANA

(1)	(2) Schools in Caddo Parish						
Eleventh and Twelfth Grade Senior Arithmetic Multi-Phase Course Outline Phase I*	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Topics:							
Tables and Graphs	x	x	x	x	x	x	x
Tables	x	x	x	x	x	x	x
Pictographs	x	x	x	x	x	x	x
Line Graphs	x	x	x	x	x	x	x
Bar Graphs	x	x	x	x	x	x	x
Circle Graphs	x	x	x	x	x	x	x
Income	x	x	x	x	x	x	x
Earning	x	x	x	x	x	x	x
Pay Check Deductions	x	x	x	x	x	x	x
Other Sources of Income	x	x	x	x	x	x	x
Budgeting an Income	x	x	x	x	x	x	x
Banking	x	x	x	x	x	x	x
Preparing to Open a Checking Account	x	x	x	x	x	x	x
Using a Checking Account	x	x	x	x	x	x	x
Reconciling a Bank Statement	x	x	x	x	x	x	x

APPENDIX H (Continued)

TABLE 22--Continued

(1) Eleventh and Twelfth Grade Senior Arithmetic Multi-Phase Course Outline Phase I*	(2) Schools in Caddo Parish							
	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School	
Spending Money Wisely								
Problems Related to Food	x	x	x	x	x	x	x	
Problems Related to Purchasing, Renting, and Maintaining Housing	x	x	x	x	x	x	x	
Problems Related to Buying and Owning a Car	x	x	x	x	x	x	x	
Problems Related to Clothing	x	x	x	x	x	x	x	
Additional Problems Related to Living	x	x	x	x	x	x	x	
Additional Problems Related to Operating a Home	x	x	x	x	x	x	x	
Cost of Medical Care	x	x	x	x	x	x	x	
Problems Related to Transportation	x	x	x	x	x	x	x	
Problems Related to Job Training and Education	x	x	x	x	x	x	x	
Problems Related to Recreation	x	x	x	x	x	x	x	

TABLE 22--Continued

(1)	(2) Schools in Caddo Parish						
Eleventh and Twelfth Grade Senior Arithmetic Multi-Phase Course Outline Phase I*	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School

* See Appendix G for criteria used in assigning students to phase schedules.

Sources: Column 1: Caddo Parish Public Schools, Help Every Low-Achiever Progress (Shreveport, Caddo Parish Public Schools, 1972), p. iii.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

TABLE 23

TOPICS IN MATHEMATICS TAUGHT CAREER STUDENTS IN THE ELEVENTH GRADE IN CADDO PARISH, LOUISIANA

(1)	(2) Schools in Caddo Parish						
Eleventh and Twelfth Grade Senior Arithmetic Multi-Phase Course Outline Phase II*	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Outline of Objectives:							
Income							
Earning	x	x	x	x	x	x	x
Paycheck Deductions	x	x	x	x	x	x	x
Other Sources of Income	x	x	x	x	x	x	x
Budgeting an Income	x	x	x	x	x	x	x
Banking							
Preparing to Open a Checking Account	x	x	x	x	x	x	x
Using a Checking Account	x	x	x	x	x	x	x
Reconciling a Bank Statement	x	x	x	x	x	x	x
Spending Money Wisely							
Problems Related to Food	x	x	x	x	x	x	x
Problems Related to Purchasing, Renting, and Maintaining Housing	x	x	x	x	x	x	x

TABLE 23--Continued

(1)	(2) Schools in Caddo Parish						
Eleventh and Twelfth Grade Senior Arithmetic Multi-Phase Course Outline Phase II*	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Problems Related to Buying and Owning a Car	x	x	x	x	x	x	x
Problems Related to Clothing	x	x	x	x	x	x	x
Additional Problems Related to Living	x	x	x	x	x	x	x

* See Appendix G for criteria used in assigning students to phase schedules.

Sources: Column 1: Caddo Parish Public Schools, Help Every Low-Achiever Progress (Shreveport, Caddo Parish Public Schools, 1972), p. iii.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

APPENDIX H (Continued

TABLE 24

TOPICS IN MATHEMATICS TAUGHT COLLEGE-BOUND STUDENTS
IN THE TWELFTH GRADE IN CADDO PARISH, LOUISIANA

(1)	(2) Schools in Caddo Parish						
Modern Algebra and Trigonometry Book 2 (Sequence)	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Topics:							
Exponential Functions, Logarithms				x	x	x	x
Trigonometric Identities and Complex Numbers				x	x	x	x
Trigonometric Identities and Formulas				x	x	x	x
The Circular Functions and Their Inverses				x	x	x	x
Progressions and Binomial Expansions				x	x	x	x
Polynomial Functions				x	x	x	x
Permutations, Combinations, and Probabilities				x	x	x	x
Modern Introductory Analysis (Sequence)							
Statements and Sets in Mathematics	x	x	x			x	x
Ordered Fields	x	x	x			x	x

TABLE 24--Continued

(1)	(2) Schools in Caddo Parish						
Modern Algebra and Trigonometry Book 2 (Sequence)	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Mathematical Induction--Sequences and Series	x	x	x			x	x
The Algebra of Vectors	x	x	x			x	x
Plane Analytic Geometry of Points and Lines	x	x	x			x	x
Functions	x	x	x			x	x

Sources: Column 1: M. P. Dolciani, S. L. Berman, and W. Wootons, Modern Algebra and Trigonometry Book 2 (Boston: Houghton Mifflin Co., 1965), pp. v-x.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

TABLE 25

TOPICS IN MATHEMATICS TAUGHT COLLEGE-BOUND STUDENTS
IN THE TWELFTH GRADE IN CADDO PARISH, LOUISIANA

(1)	(2) Schools in Caddo Parish						
Modern Introductory Analysis (Sequence)	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School
Topics:							
The Field of Complex Numbers	x	x	x			x	x
Graphs of Polynomial Functions	x	x	x			x	x
Exponential and Logarithmic Functions	x	x	x			x	x
The Circular Functions and Trigonometry	x	x	x			x	x
Properties of Circular and Trigonometric Functions	x	x	x			x	x
Vectors, Trigonometry, and Complex Numbers	x	x	x			x	x
Analytic Geometry and Matrices	x	x	x			x	x
Space Geometry	x	x	x			x	x
Probability	x	x	x			x	x

TABLE 25--Continued

(1)	(2) Schools in Caddo Parish						
Modern Introductory Analysis (Sequence)	Byrd High School	Captain Shreve High School	Fair Park High School	North Caddo High School	Northwood High School	Southwood High School	Woodlawn High School

Sources: Column 1: M. P. Dolciani, E. F. Beckenbach, A. J. Donnelly, R. C. Jurgensen, and W. Wootons, Modern Introductory Analysis (Boston: Houghton Mifflin Co., 1967), pp. v-x.

Column 2: Based on questionnaire survey of Caddo Parish Principals conducted in Fall of 1973.

AUTOBIOGRAPHY

Rogers William Martin was born November 21, 1922, in Naples, Texas. His family moved to various towns in Louisiana and finally to Shreveport, Louisiana, where he was graduated from C. E. Byrd High School.

After going to business college and working for a year, he entered Centenary College, located in Shreveport, for a period of one semester. He served in the United States Army Air Corps from 1941 until 1946 when he was honorably discharged. While in the service, he was sent to the University of Cincinnati and the University of Indiana as a student in the Army Specialized Training Program.

Upon return from active duty, he enrolled at Centenary College, again, and completed undergraduate studies February, 1948. He immediately went to work for a local utilities company. In 1952 he was employed by the Caddo Parish School Board as a high school mathematics teacher in Rodessa High School, Rodessa, Louisiana.

In 1954 he was granted a du Pont Fellowship to study natural sciences at the University of Delaware. He taught for one and one-half years in a Junior High School in Wilmington, Delaware, before returning to Shreveport and a position as teacher in mathematics, which position he has at present.

In 1959 he enrolled at Northwestern State College, and in January, 1963, he received the Master of Education from that institution.

He is married to Sue Lynn Tucker, of Marion, Louisiana, and they have one son, Rogers, Jr.